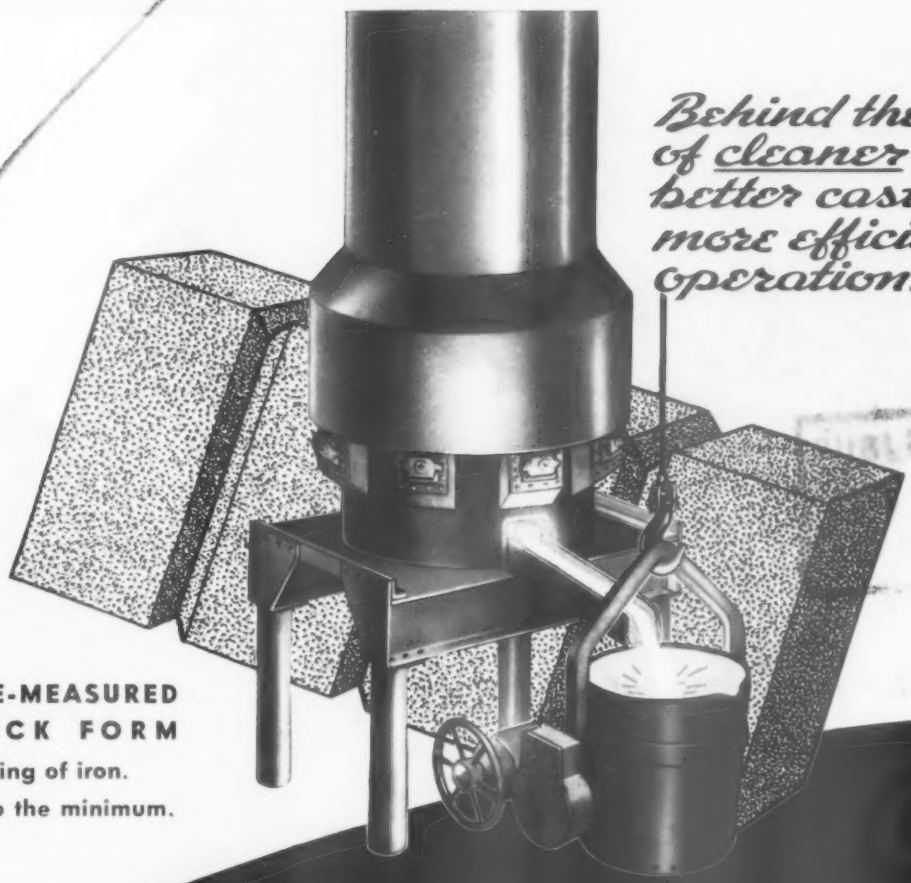
October, 1950

THE FOUNDRY

wherever metals are cast...



Behind the production of cleaner metal for better castings, and more efficient cupola operation.

EXCLUSIVE PRE-MEASURED SCORED BRICK FORM

- Simplifies cleansing of iron.
- Reduces labor to the minimum.

Famous CORNELL CUPOLA FLUX

FAMOUS CORNELL FLUXES
Trade Mark Registered

The CLEVELAND FLUX *Company*

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL CUPOLA FLUX CLEANSES MOLTEN IRON, MAKES IT FREER FLOWING; KEEPS SLAG FLUID; REDUCES SULPHUR; MAKES CASTINGS SOUNDER, CLEANER; IMPROVES MACHINABILITY; KEEPS CUPOLAS CLEANER, REDUCES MAINTENANCE TIME AND COST.

WHY *PROGRESSIVE* FOUNDRIES RELY ON . . .

A modern cupola, holding ladle and electric bull ladle installation in Meadow Lands, Pa., plant of American Brake Shoe Co.

for Better Castings

Purite is widely accepted as the most economical desulphurizer and cupola flux by progressive foundry operators everywhere. And here are seven good reasons why:

1. **Purite gives 100% fluxing action in the cupola — 100% desulphurizing action in the ladle.**
2. **Purite gets to the iron quicker — no faster desulphurizer made.**
3. **Purite is time-tested and proven for unsurpassed desulphurizing uniformity.**
4. **Purite comes in 2-lb. pigs — no weighing or measuring required.**
5. **Purite is 100% fused soda ash — you do n pay for inert materials.**
6. **Purite does not crumble — no waste — no dus**
7. **Purite can be shipped in bulk carloads substantial savings over bag shipments — easily stored without deterioration.**

These everyday benefits show why Purite en joys such widespread use as the foremost cupol flux and ladle desulphurizing agent. For ful information, write today for literature tellin how you can improve your iron with Purit Mathieson Chemical Corporation, Mathieso Building, Baltimore 3, Maryland.

PURITE
100% FUSED SODA ASH
The Scientific Flux for Better Melting and Cleaner Iron

Purite is sold by all leading foundry supply houses in the United States and Canada.

Mathieson
CHEMICALS

81

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEAL

NISILOY

A POWERFUL, POSITIVE INOCULANT

Cuts Final Cost of Gray Iron Castings

by improving

MACHINABILITY, GRAIN STRUCTURE, UNIFORMITY

BENEFITS TO FOUNDRYMEN

Reduces Rejects – Used for structure control of cast iron, Nisiloy helps your foundry meet daily schedules for uniform lots of machinable gray iron castings.

Promotes Sound Castings – Diffusing rapidly throughout the melt, Nisiloy promotes a dense, close-grained product.

Curbs Breakage – Even where section thickness varies sharply, Nisiloy serves to eliminate chilled edges and surfaces, thus affording a tougher cast iron that resists breakage in shop handling.

No Scrap Problem—Containing only elements that dissolve freely in iron, Nisiloy permits remelting sprues and gates in any successive melt without risk of adding chill-forming elements.

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For full information about this nickel-silicon alloy, one of the most useful products ever offered for improving machinability and structure of gray iron castings, fill in and mail the coupon below.

BENEFITS TO CASTING USERS

Excellent Machining Qualities—The dense, gray, machinable structure secured with Nisiloy reduces machining time, tool wear, rejects and costs.

Increased Wear-Resistance—The formation and distribution of finely divided random flake graphite accomplished with Nisiloy assures highly improved resistance to wear.

Improved Toughness—Nisiloy acts to eliminate hard, chilled areas . . . thus, the casting is thoroughly machinable in thin and thick sections alike and less sensitive to breakage in machining operations and general service.

Dependable Pressure-Tightness—The sound, homogeneous structure attained by inoculating with Nisiloy results in dense cast iron that provides substantially improved pressure-tightness.

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TRADE MARK

The International Nickel Company, Inc.
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"NISILOY" for GRAY IRON CASTINGS

Name.....*Title*.....

Company.....

Address.....

City.....*State*.....

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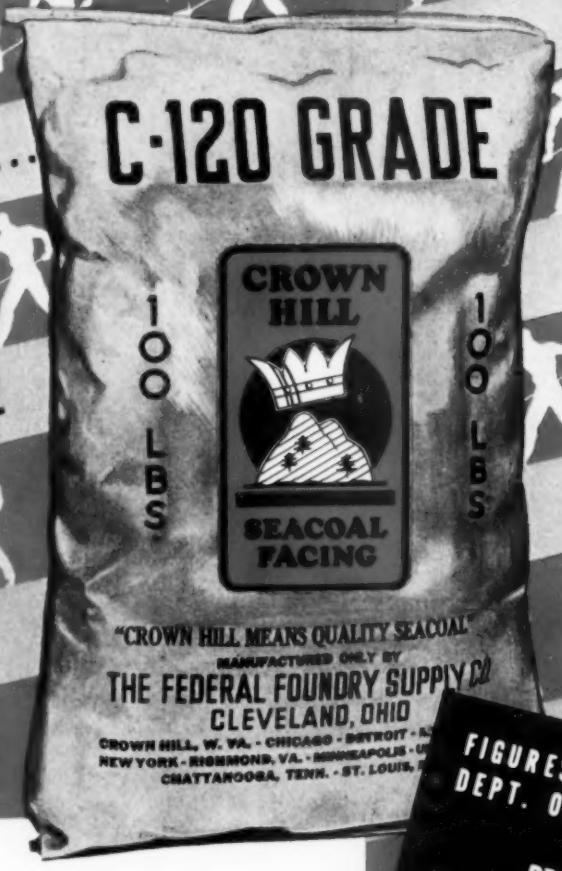
MORE...

MORE, MORE AND MORE...

FOUNDRYMEN CHOOSE

CROWN HILL

SEACOAL



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Quality . . . Crown Hill's high volatile induces quick combustibility, quicker escape of gas and steam, better finish, lower cleaning costs, fewer defects.

Popularity . . . Foundrymen far and wide have used Crown Hill for many years. They know by experience how good Crown Hill really is.

Manufacturer . . . Made by the friendly friend of the foundries, The Federal Foundry Supply Co., a good company with which to do business.

Test Crown Hill Seacoal Facing in your foundry.

FIGURES FROM BUREAU OF MINES
DEPT. OF INTERIOR OF THE U. S.
(Moisture Free)

PROXIMATE ANALYSIS

Volatile Matter (V.C.M.)	38.9%
Fixed Carbon	57.4%
Ash	3.7%
	100.0%

ULTIMATE ANALYSIS

Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
	100.0%

Fusion Point of Ash 2,980° F.

THE FEDERAL FOUNDRY SUPPLY COMPANY

OCTOBER, 1950

THE FOUNDRY

VOLUME 78—NUMBER 10

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2. ***Overnight Delivery*** to any foundry, from one of LINOIL's 24 warehouses. LINOIL can lighten your inventory load.

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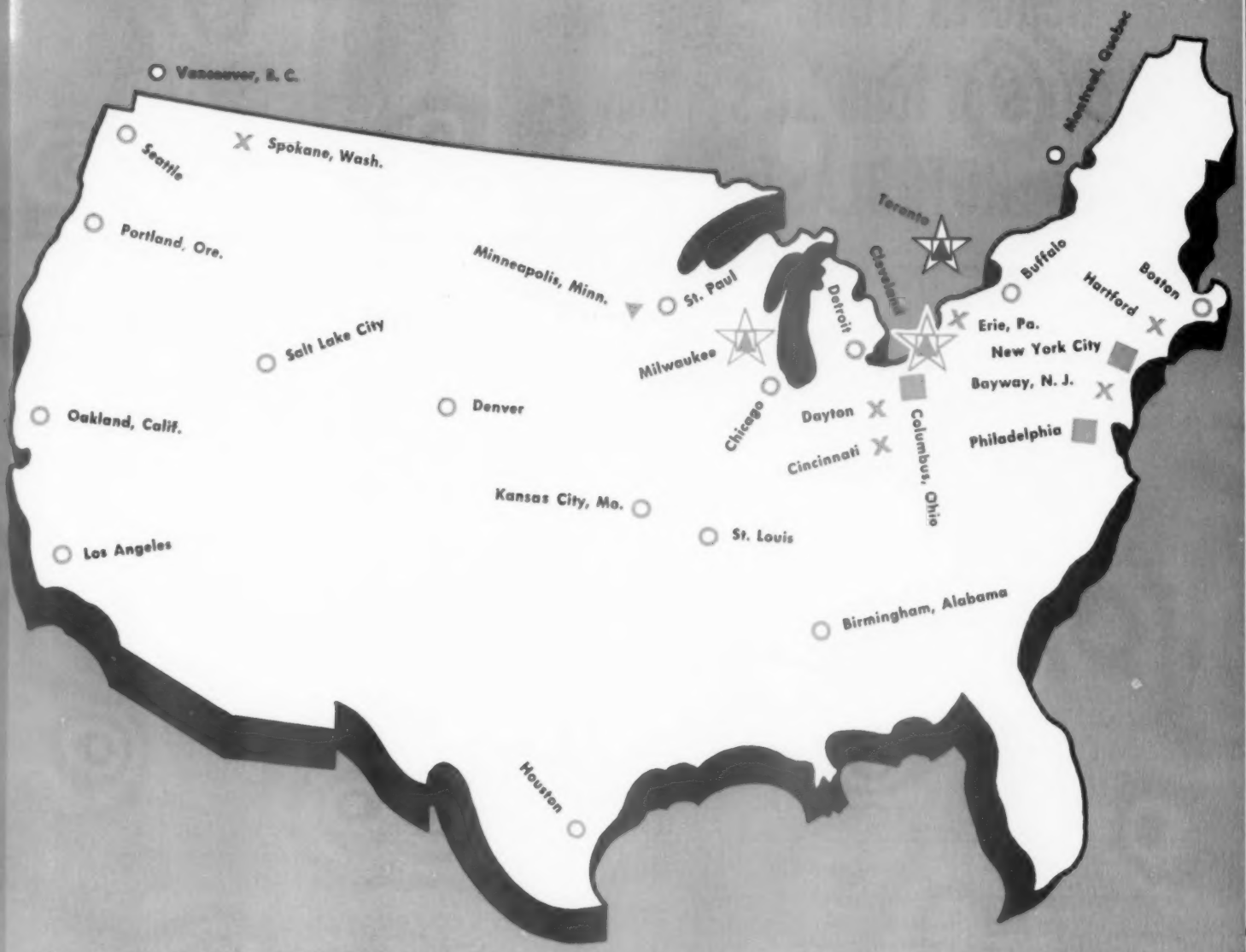
4. ***Nation-wide sales force,*** covering every foundry center in the United States and Canada. The average LINOIL representative brings you over 12 years of foundry experience.

This is the service that is part of every drum, carload, or tank-car of LINOIL.



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ROTOBLAST saves labor — industry's biggest single cost item. In each of the three typical ROTOBLAST cases tabulated below, *savings on labor* averaged well over $100 a week. In addition, cleaning took less time and power costs decreased.

Saved with ROTOBLAST

ROTOBLAST UNIT	CASH SAVED	NAME OF USER
Table-Room	**$11,102** *on labor alone*	Lewistown Foundry, Lewistown, Pennsylvania
Room	**$10,160** *on labor alone*	Harris-Seybold, Cleveland, Ohio
Barrel	**$5,080** *on labor alone*	Yates-American Machine Co., Beloit, Wisconsin

If you want savings like this, specify Pangborn ROTOBLAST. Whether you clean castings or forgings, grey iron, brass or steel, you'll find ROTOBLAST saves money and speeds up cleaning with no sacrifice in quality!

ROTOBLAST*

ROTOBLAST

SAVES LABOR: *One ROTOBLAST machine and operator can do as much as a two-man crew and old-fashioned equipment.*

SAVES SPACE: *In many cases, one ROTOBLAST machine replaces five or more old-fashioned machines, requires less space.*

SAVES TIME: *Cases on record prove ROTOBLAST can cut cleaning time up to 95.8% compared with old-style methods.*

SAVES POWER: *Modern ROTOBLAST uses but 15-20 h.p. compared to old-fashioned equipment requiring 120 h.p. for same job.*

SAVES TOOLS: *On work cleaned with ROTOBLAST, cutting tools last up to ⅔ longer because no scale is left to dull edges.*

. . . and these savings mean INCREASED PROFITS for you!

Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Pangborn

* Trademark of Pangborn Corporation

Cleans These Intricate Castings for 2¢ EACH!

An actual case report from Garden City Foundry, Stoughton, Wis.

"Reduced our cleaning costs!" says superintendent John Selgrath about Garden City's ROTOBLAST team of Table and Barrel. Costs on two intricate flywheel castings back up his statement. The smaller 31 lb. piece is cleaned by the ROTOBLAST Table shown above for only *2c each!* Larger 49 lb. flywheels are cleaned in the Barrel for just 5.3c each—and both figures include *all labor, power and operating costs!*

But that's not all. Breakage used to seriously hamper production, but no more. Cleaning is faster too, and now Garden City states it can give its customers *any finish they want!*

IF YOU WANT TO CUT COSTS TOO, find out about Pangborn ROTOBLAST. There's a ROTOBLAST Table, Barrel, Table-Room and Monorail Cabinet for every blast cleaning job. To find out how modern Pangborn ROTOBLAST equipment can save you money, send for Bulletin 214. It contains valuable specifications, performance data and photographs. For your copy, write today to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

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MORE THAN 25,000 PANGBORN MACHINES SERVING INDUSTRY

BLAST CLEANS CHEAPER

with the right equipment for every job

KEEP IN THE BIDDING . . .

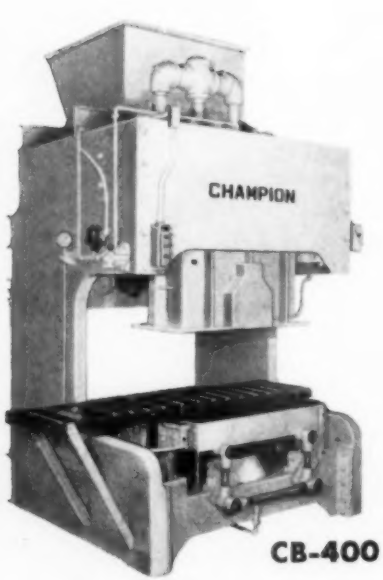
"Championize"

and sell

CB-10

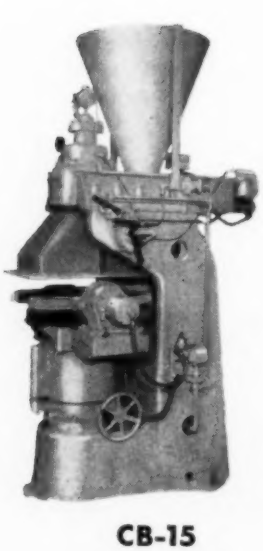
CB-5

The broad line of Champion Core Blowers includes a size and type for your every core blowing requirement. From the newest, smallest model, the CB-5 (Junior) up to the mammoth CB-400 every Champion possesses the same safe, simple, speedy operation . . . the same distinctive blow valve that assures a perfect core in a fraction of a second with the standard air pressure of 85 to 100 pounds.

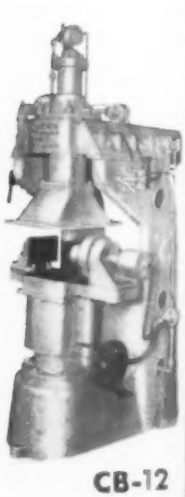


CB-400

CB-18

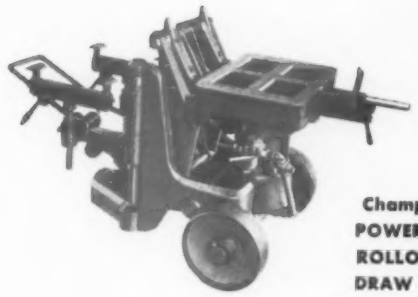


CB-15



CB-12

Champion Type W.
HAND RAM, ROLLOVER
AND DRAW MACHINE

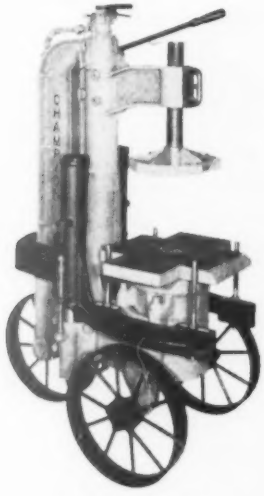


Champion Type JM
POWER JOLT, HAND
ROLLOVER AND
DRAW MACHINE

YOUR FOUNDRY

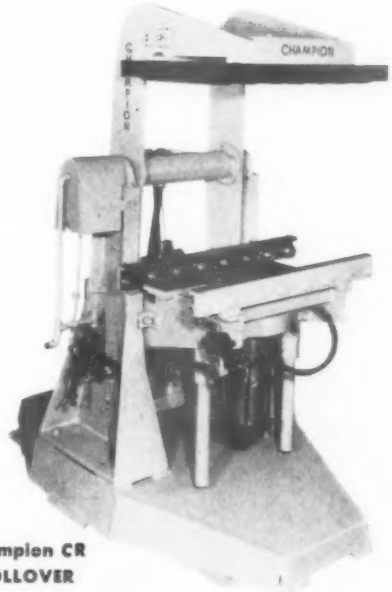
better castings at lower prices

Leading foundries that use Champion Core Blowers and molding machines to produce better castings at lower costs have the greatest possible sales advantage of marketing higher quality castings at lower prices. It'll pay you to Championize your foundry . . . to maintain full control over the quality and cost of your production.



Champion Type JSL
JOLT SQUEEZE
PIN LIFT

Champion Rollover and Draw Machines and Jolt Squeezers are designed to give you maximum service and efficiency. Let us show you how Champion equipment can fit perfectly into your foundry production picture.



Champion CR
ROLLOVER

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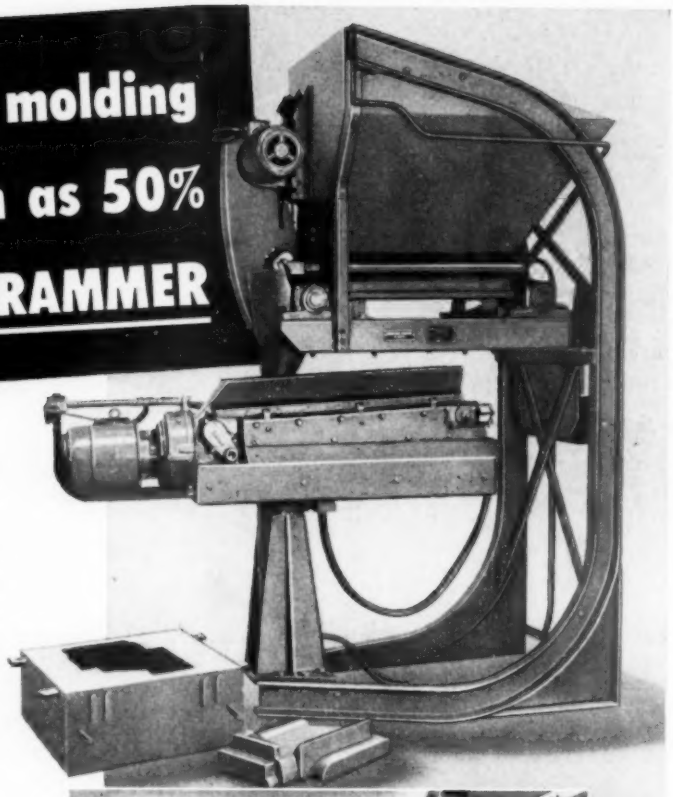
TABOR SAYS...Reduce molding costs by as much as 50% with "JUNIOR" SANDRAMMER



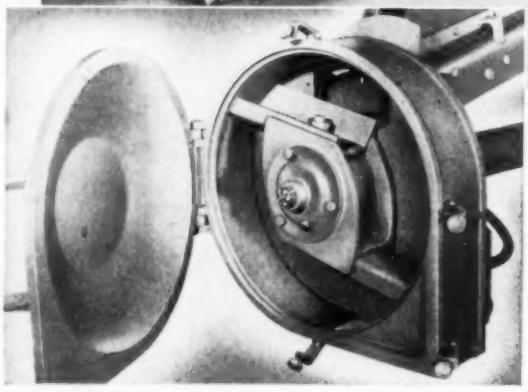
GREATER RAMMING SPEED AND FLEXIBILITY are the reasons behind "Junior's" ability to cut costs.

SPEED—The new-type Impellor Head rams molds at a phenomenal rate. Trolleys and swivels are finely balanced, ball-bearing mounted for ease of operation. Simple, sequence, push-button controls are at the operator's finger tips.

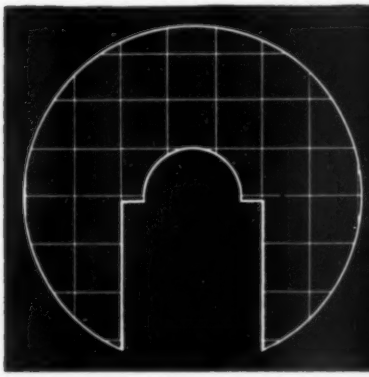
FLEXIBILITY—"Junior" quickly pays for itself in core room or on small jobbing floor. Ideal for ramming up molds from loose patterns, for short-run core making, and for handling light to medium production work in both core room and foundry. Can be moved by crane from area to area, or mounted on rail-car for along-track ramming. Adaptable to hand, hoist, or over-head system sand feeding.

PLUS—Low original cost, long trouble-free life, low operating and maintenance costs.

Summed up, "Junior" Sandrammer is a machine you can keep at work *all day, every day.* That means sound investment—quick pay-off.



Adjustable, multi-blade impellors give greater ramming speed and five-fold life. Simple blade adjustment compensates for wear and controls density of mold. Rams mold with equal density throughout whole area and depth.



The blocked portion of this diagram shows working floor area covered by ramming head of "Junior" Sandrammer. Since each block represents one square foot, this sketch quickly tells you the combined maximum lengths and widths of molds which the "Junior" can handle.

"JUNIOR" SPECIFICATIONS

Height from floor to top of hopper	8'- 8¾"
Height from floor to sand discharge point	2'-10½"
Max. height of flask	2'- 9½"
Hopper capacity	675 lbs.
Sand throwing capacity	Up to 150 lbs. per minute

Write, wire or 'phone.
A Tabor engineer will be ready to team up with you.

The TABOR *Manufacturing Co.*

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Tabor Manufacturing Co. is licensed to manufacture and sell Sandrammers by Foundry Equipment, Ltd., Leighton Buzzard, Bedfordshire, England.

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See McKee Eclipse Booth 927, at the Metal Show CHICAGO OCT. 22-27

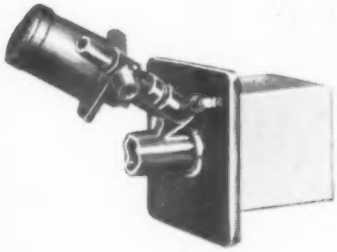
Back of every one of these New McKee-Eclipse Products is more than 30 Years Experience with combustion equipment designed for all types of applications and burning any type gas or combination of gases.

NEW **Series "LT" McKee-Eclipse LOCK-TITE Safety Valve**

Generally acclaimed as one of the most unusual and important developments in recent years in the industrial gas field! Makes possible for the first time, instantaneous Gas Shut-Off under *any* or *all* unsafe conditions. As a *double* protection, when the gas valve has snapped shut due to an unsafe condition, it must be opened manually, and only after the unsafe condition has been corrected.

NEW **McKee Consta-Mix Proportioning Valve**

The very latest in a wide selection of McKee Air-Gas Mixers, L-P Proportional Mixers and Diluter Valves. Permits minute adjustment of the air-gas mixture at any point in valve capacity, and independent of pressure or other fluctuations.



NEW **Series "PW" McKee-Eclipse Piloted Wall-Tite Burners**

Another remarkable McKee-Eclipse Advancement! A Sealed Burner with Flame Failure Protection and Constant Blast Pilot. Particularly suitable for low temperature applications or where burners are in a "difficult-to-light" location.

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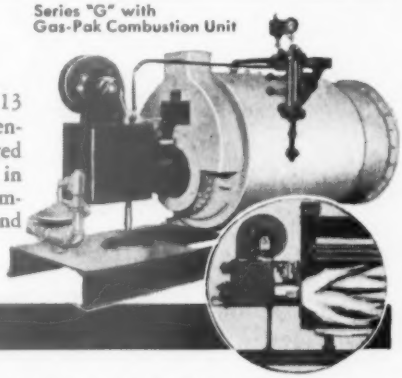
NEW **Super-Matic Scotch "Steamboilerplants"**

These new Scotch Marine Boilers (13 years field-tested) are part of an extensive line of McKee Automatic Gas-Fired "Steamboilerplants" 12 to 100 H.P., in vertical and horizontal models. "Complete package" ready to connect up, and operate at the push of a button.

Series "G" with Gas-Pak Combustion Unit



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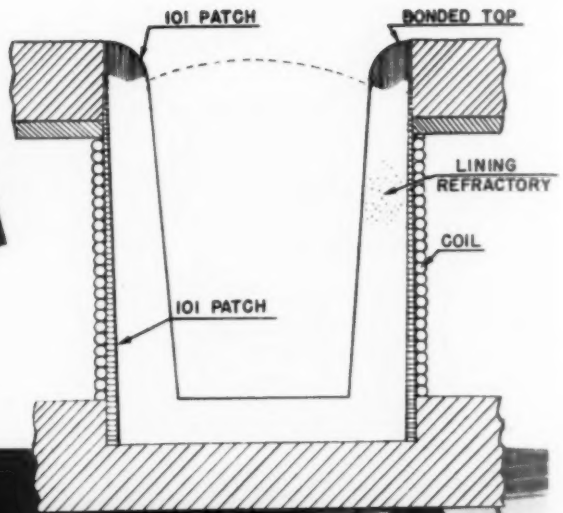
TASIL NO. 101 PATCH

FOR AJAX-NORTHRUP HIGH FREQUENCY INDUCTION FURNACES



TASIL No. 101 Patch in Ajax-Northrup Furnace

● Taylor Sillimanite No. 101 Patch provides two-fold protection of the water cooled, copper primary coil in Ajax-Northrup and similar types of induction furnaces—during the ramming of the crucible proper—and in the event of a leak through the crucible while the furnace is in operation. Properties which qualify TASIL No. 101 Patch for service in these furnaces are:

★ High di-electric strength
★ Smooth working properties
★ Softening point above 3200° F.
★ Negligible shrinkage or expansion
★ Can be used with either an Acid or Basic lining.

REMEMBER: a complete line of TASIL (mullite), TACOR (corundum base) and Taylor Zircon Ramming Mixes and Cements are made to fit every metallurgical need.

Refractorers to industry since 1864.

Exclusive Agents in Canada:
REFRACTORIES ENGINEERING AND SUPPLIES, LTD.
Hamilton and Montreal

The CHAS. TAYLOR SONS Co.

MANUFACTURERS OF REFRACTORIES • CINCINNATI • OHIO • U.S.A.

American Wheelabrator gets good results with SIMPLICITY SHAKEOUT UNIT

Typical Airless Wheelabrator Unit of which there are over 5,000 in use today in industry for blast cleaning.

In under 20 minutes, an entire heat of 260 to 300 molds containing wheel blade castings are handled on this Simplicity Shakeout installed in the American Wheelabrator & Equipment Corporation foundry at Mishawaka, Indiana. These castings average 4 to 5 lbs., and the Wheelabrator foundry reports that *much higher production* has been maintained since the installation of the Simplicity equipment. Simplicity Shakeouts are available in all sizes ranging from the big heavy duty "Quads" to a 2′ x 3′ Model A to handle *every type of production requirement.* If you're having shakeout trouble in your foundry just call for a Simplicity sales engineer . . . he can give you the answer. Why not write today.

FOR CANADA:
Canadian Bridge
Engineering Co. Ltd.
Walkerville, Ontario

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN

ARE YOUR INCENTIVE PLANS UP-TO-DATE? . . . OUT-OF-BALANCE?

NOTE:

Mr. John Taylor has joined Lester B. Knight & Associates, Inc., as vice-president in charge of the Industrial Engineering Division. Mr. Taylor brings 27 years of successful industrial engineering experience and 14 years of professional foundry engineering service to the Knight organization.

Now is the Time to Review Incentives, Methods, Controls, Scheduling, Budgets

General foundry *procedures* must be as modern as the *facilities* if satisfactory production, costs and labor relations are to be maintained. Under today's rapidly-changing conditions, it is increasingly important that job evaluation, incentives and other factors be reviewed in the light of present and expected future conditions.

Knight Industrial Engineers, with years of successful experience in setting up and revising modern standards, can offer you valuable service on a temporary basis. These professional engineers are familiar with today's problems in all types and sizes of foundries and can make reliable recommendations to assure a more successful operation in your plant.

Knight offers a complete foundry service—from reorganization of one department to the design and layout of a complete new plant—so whatever your problem may be, Knight Engineers can be of valuable assistance. No job is too small to receive prompt attention—no job is too large.

Knight Services For Foundries:

- Foundry Engineering
- Architectural Planning
- Foundry Layout
- Foundry Modernization
- Foundry Management
- Industrial Engineering; Job Evaluation, Incentives
- Production and Cost Control

LESTER B. KNIGHT & ASSOCIATES INC.

Consulting *Engineers*

600 W. JACKSON BLVD.
CHICAGO 6, ILLINOIS

30 CHURCH STREET
NEW YORK 7, NEW YORK

CONSULTING SERVICE
for Management • Sales • Production

ENGINEERING SERVICE
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QUICK DELIVERY

By Air Freight, Parcel Post, Special Delivery or Railway Express. Pick-up and delivery by jobber representatives in the following areas:

MILWAUKEE, WIS.
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Bluemound 8-8989

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Clarence C. Schmidlin
Normal 8743-1

Illustrated in the photographs above are a 4 gang booked type aluminum core box and properly cleared white metal drier pattern made from a single core plug. Approximately one-half core box size, 8x12x1¾ inches.

Core plug and skeleton backing frames for core box and drier were furnished as shown. Cost for full core box $42.00, and white metal drier $38.00.

Disc grinder finish will suffice on the faces of pressure cast core boxes, but they may be machine finished, if necessary, without fear of porosity.

The more complicated the core, the greater the relative saving.

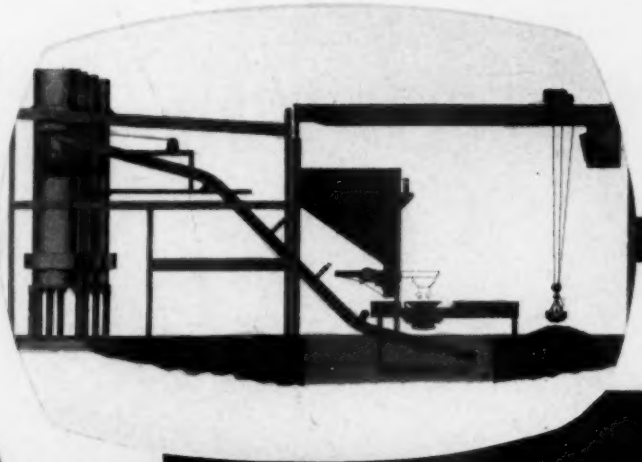
Write for new catalog which will be available in April.

Accurate **MATCH PLATE COMPANY**

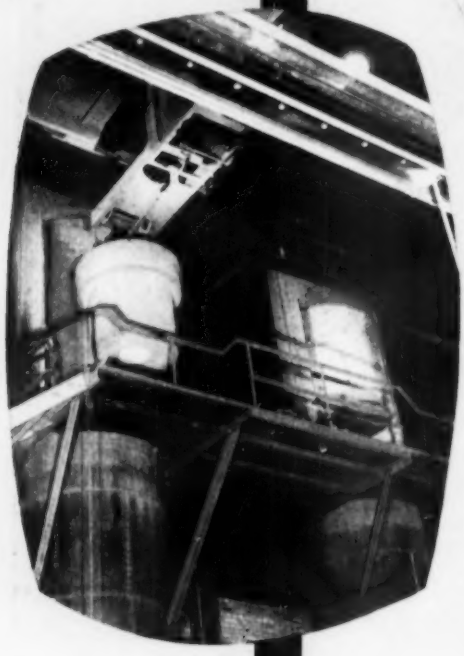
1849 WEST CARROLL AVENUE, CHICAGO 12

Telephone Seeley 3-7918-19

The swivel-type skip hoist charger can serve a battery of cupolas—two, three, or four.



This is the underslung crane type charger. Whiting provides crane-type chargers as well as skip hoist chargers.



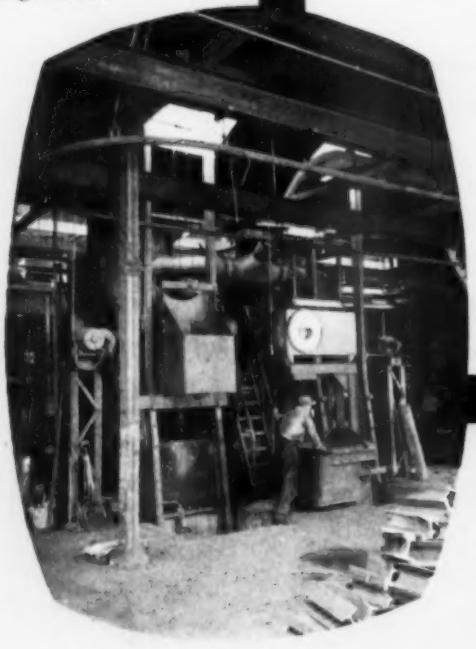
LET MECHANICAL DO YOUR

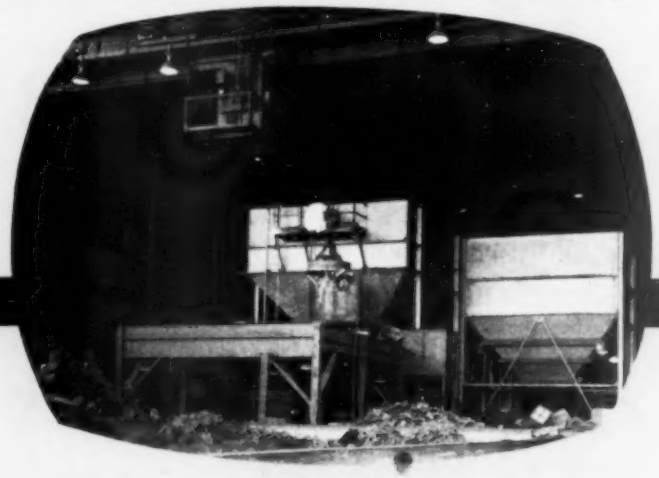
Now is the time to end the dirty, backbreaking work of hand-charging . . . to end the bickering and squabbles over working conditions. Whiting has helped scores of foundries—both small and large—to mechanize cupola charging operations and attract better workers.

Here charging does more than improve working conditions . . . it improves the quality of the melt and assures uniform quality castings. It reduces costs, thus enabling foundries to meet today's keen competition.

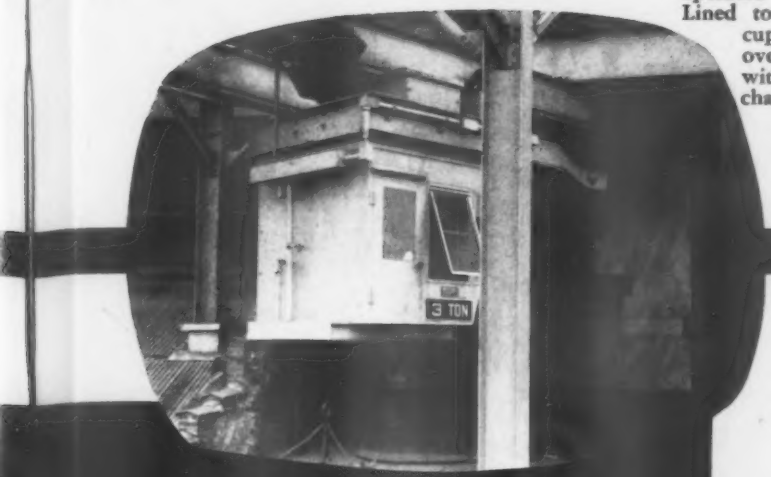
Whiting Mechanical Chargers are engineered to the needs of each individual customer, by men who have long

Two #4 Whiting Cupolas are charged with skip hoists. The operator is spotting a loaded bottom-drop bucket over the charging bucket.





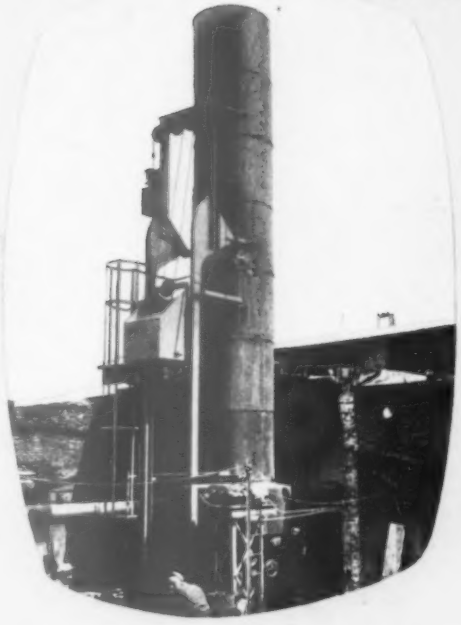
Make-up yard at another foundry where four men charge three cupolas on a 3-minute cycle.



These two #7 Cupolas are operated on alternate days. Lined to 42 inches, these cupolas can produce over 60 tons per day, with the help of mechanical charging.

In another make-up yard, a locomotive crane uses a magnet for iron charging. Or it changes to a bucket for unloading incoming freight cars of coke or stone.

CHARGING
DIRTY WORK



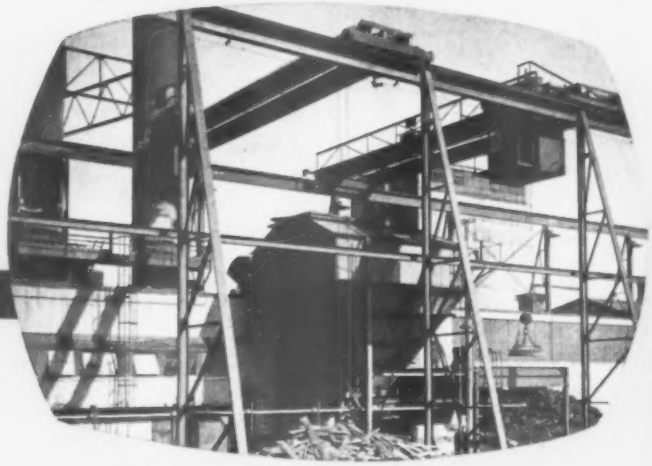
This vertical skip hoist is used principally for small cupolas. A big time and labor saver.

experience as practical foundrymen. They can provide equipment to handle materials from materials yard to cupola.

Whiting foundry engineers will gladly discuss with you how mechanical charging can best be adapted to your operations, whatever the size of your plant. Ask them . . . there is no obligation. Send for Bulletin FY-153.

WHITING CORPORATION

15607 LATHROP AVE. HARVEY, ILLINOIS



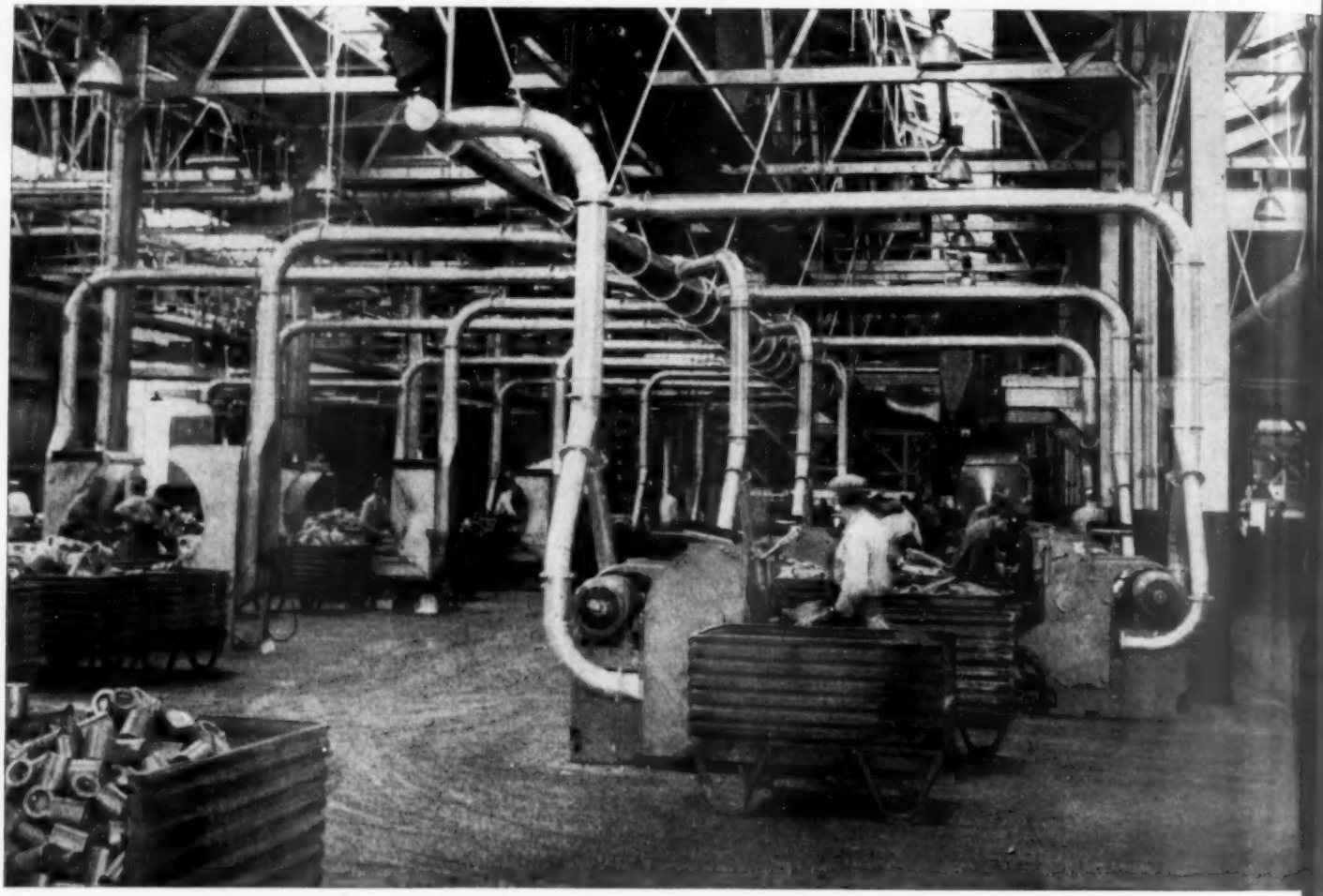
For this foundry, Whiting furnished materials-handling crane, make-up platform, coke-and-stone bin, and charging crane—a completely mechanized charging system.

Offices in Chicago, Cincinnati, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Representatives in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.

WHITING
MECHANICAL CHARGING
★ SYSTEMS ★

BETTER AIR

Casting cleaning department in a large modern foundry.



ROTO-CLONE *eliminates dust at the source,*
to improve working conditions—installation is rapid, cost is low.

Men who work at these double-wheeled pedestal grinders, portable grinding and chipping benches in this modern foundry might well be called "white collar workers". So effective is the hooding and dust control for each unit, that dust doesn't have a chance to settle on workmen. Instead, it is exhausted and collected by Type D Roto-Clones*.

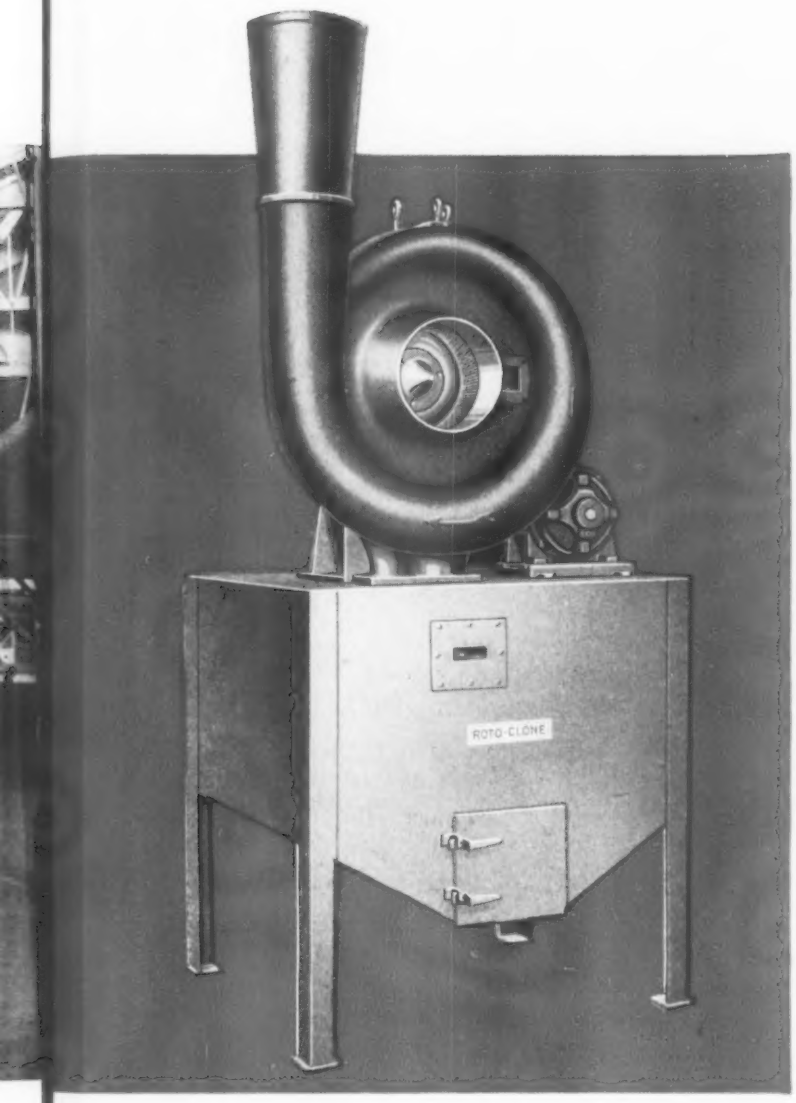
The Type D Roto-Clone combines exhauster, dust collector and storage hopper in a single unit. It is extremely compact, can be installed at or near the source of the dust or as a central system similar to the above installation.

Thousands of Type D Roto-Clones installed in foundries attest to the wide acceptance of this economical method for dry collection of granular process dust. Under varying conditions of temperature, air volume, or operating speeds, Roto-Clone maintains high efficiency, delivers dependable and trouble-free service.

On page at right you see more advantages, good reasons why AAF's Roto-Clone can work profitably for you.

...betters working conditions

IN CLEANING ROOMS



THE TYPE D ROTO-CLONE IS A COMPACT, SELF-CONTAINED UNIT... offering these advantages

HIGH EFFICIENCY—in dust separation over a wide range of dust particle sizes regardless of specific gravity or operating temperatures—up to 750° F.

UNIFORM AIR DELIVERY—for satisfactory air flow at hoods and unvarying air velocities in branch pipes and main ducts.

LOW INITIAL COST—LOW OPERATING COSTS—Can be installed convenient to dust source, saving expense of long pipe runs and outdoor collectors. Greater mechanical efficiency saves power normally required for dust separating function.

AAF's TYPE D ROTO-CLONE SERVES A WIDE VARIETY of dry collection jobs where granular process dust is a problem. Here are some typical applications:

In exhaust systems for grinding, cutting, broaching and polishing operations; for crushers, pulverizers, elevators, and belt transfer points; in processing, conveying, mixing and applying materials in granular or powdered form; the cleaning of high temperature exhaust or stack gases from boilers, kilns, dryers and coolers; the collection of fines from dedusting, air classifying and material cleaning; and the removal of atmospheric dust, snow and rain for forced ventilation of motors and electrical equipment. It is also applicable to low-pressure conveying, in the form of a closed system when complete collection of the conveyed material is desired.

**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc. for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

For complete engineering data write now for Bulletin 272-A.

AAF

American Air Filter

COMPANY, INC.

266 CENTRAL AVE., LOUISVILLE 8, KY. — *In Canada:* DARLING BROS., Ltd., Montreal, P. Q.

dag DISPERSIONS®

Products bearing the registered trademark **"dag"** originate only with the Acheson Colloids Corporation, Port Huron, Michigan, or with Acheson Colloids Ltd., London, England. Acheson Colloids is the world's largest producer of colloidal graphite dispersions for the metalworking and electronic industries, and also supplies dispersed pigments to a large segment of the color-consuming trade. The trademarks "Oildag", "Aquadag", "Prodag", "Glydag", "Castordag", "Varnodag" and "Gredag" identify particular products of Acheson Colloids Corporation or its affiliates, and are duly registered in the United States and in other principal countries of the world.

dag DISPERSIONS®

Acheson Colloids Corporation, Port Huron, Michigan

. . . also Acheson Colloids Limited, London, England

Cuts Core Handling—Storage!

Reduces Core Making Time From Days To Minutes

THE BIG SAVINGS you get by using the *Foundromatic* Sand Core Dryer stem chiefly from cutting storage space and handling labor. Just how big your savings could be depends on labor and overhead charges in your plant.

Add to this, fuel savings of 30 to 80% (depending on the type of binder you are now using) . . . plus a saving in drying time up to 80% and you begin to see the tremendous advantage of this revolutionary new system.

END OVERBAKING OF CORES

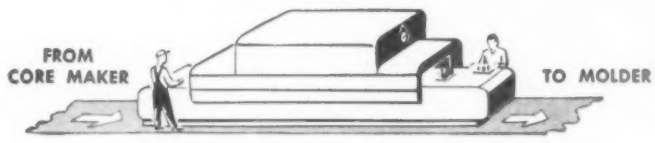
In addition, overbaking of cores is impossible. Ends burning of fins or thin sections of cores. Practically eliminates rejects.

Working conditions are improved too. Fumes and heat are eliminated from the core room, because all the heat that is generated goes into the core.

Any core that will pass through an aperture 36 inches wide and 13 inches high can be dried in the *Foundromatic* sand core dryer.

Allis-Chalmers engineers are prepared to help you. Their experience is based on several years of development work in A-C's huge foundries where electronic skills and real foundry practice were combined.

A-3097



FOUNDROMATIC CORE DRYER

FOUNDROMATIC DRYER WAY

OLD WAY

3 STEPS YOU CAN ELIMINATE

1. Eliminate collecting racks. Cores are placed directly onto the moving conveyor belt of the *Foundromatic* Sand Core dryer.

2. Eliminate cooling racks. When cores come out of dryer, they're cool enough to be handled bare-handed.

3. Eliminate curing and storage racks. Cores can be made as needed in a matter of minutes, without building stocks on curing and storage racks.

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

ALLIS-CHALMERS, 1032A SO. 70 ST.
MILWAUKEE, WIS.

Please send information on the *Foundromatic* Sand Core Dryer.

Name.....

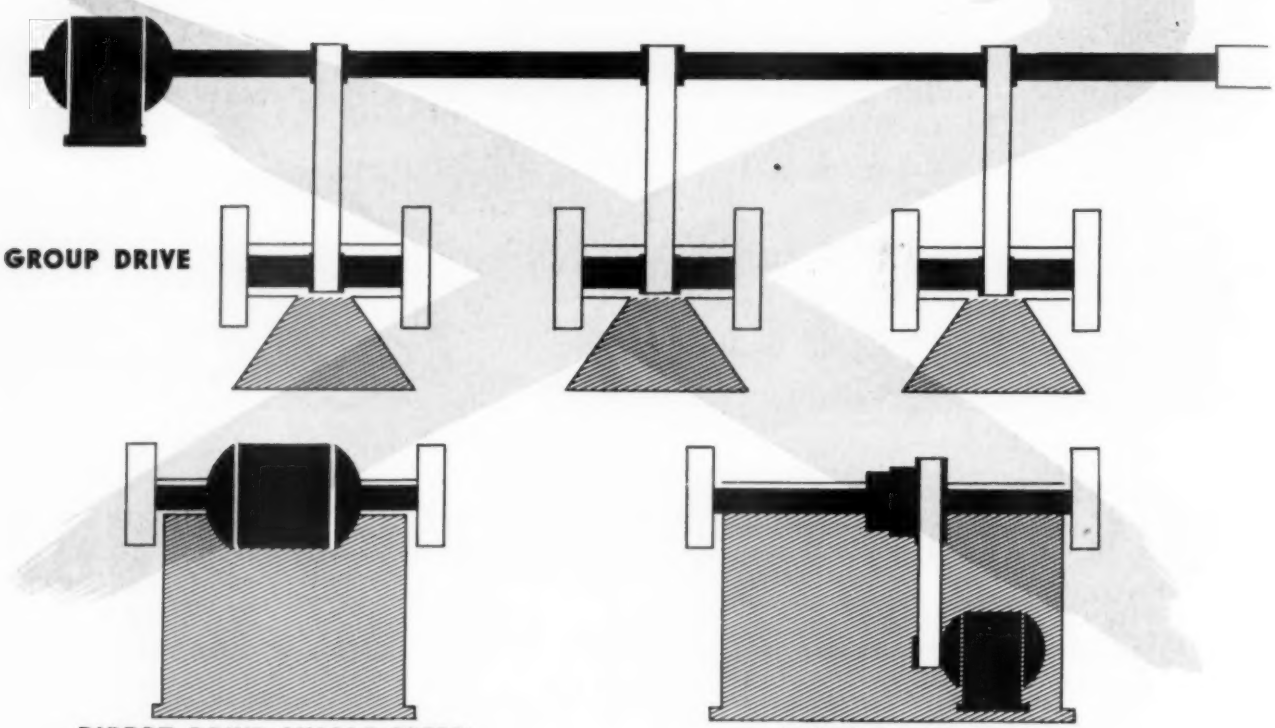
Title.....

Company.....

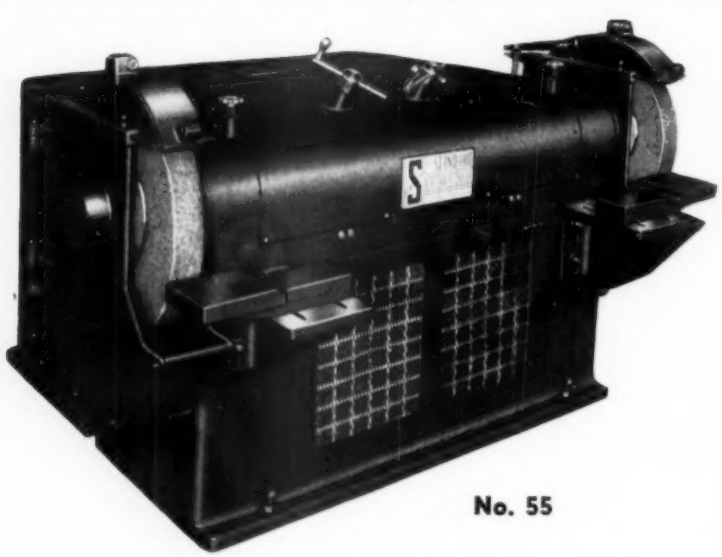
Street.....

City..... State.....

WHY PAY FOR INEFFICIENCY?



HERE'S THE WORLD'S MOST MODERN SNAGGING GRINDER



No. 55

STANDARD'S INFINITELY VARIABLE SPEED TWIN-MOTOR SNAGGING GRINDER

INCREASES PRODUCTION 40%!
INCREASES WHEEL LIFE!
LOWERS WHEEL COST!
EACH OPERATOR INDEPENDENT OF THE OTHER!

24" or 30" Vitrified or Resinoid Bond Wheels.
Twin motors of H.P. selected up to 50 H.P.

The Standard No. 55 is a 2-in-1 machine—each operator is entirely independent of the other; one side may be stationary while the other wheel is operating; one side may be operated with a wheel differing in diameter to the other side, but each wheel operated at its correct and efficient peripheral speed.

SPEED CONTROL: Turn Hand Wheel to adjust **individual** wheel guard as wheel wears and simultaneously increase spindle speed in direct relation to worn wheel diameter, thus maintaining peripheral speed throughout wheel life. Safety interlock prevents overspeeding on grinding wheel.

NOTE: No Tool or Wrenches are required—merely turn the Hand Wheel.

WRITE FOR CATALOG 44 TODAY!

See this machine in operation at Booth 2102, National Metal Exposition and Congress, Oct. 23 to 27, Chicago, Ill.

The STANDARD ELECTRICAL TOOL *Co.*

2507 RIVER RD., CINCINNATI 4, OHIO

EVERY FOUNDRY

Should Have This Booklet!

For a quick but thorough explanation of the "Croning Process" for making sand molds and cores, you should send today for your free copy of a new 16-page, illustrated booklet just released by Bakelite Division.

Here are a few of the numerous production advantages of this new process for producing thin-shelled molds and cores bonded with BAKELITE Phenolic Resins: Castings can be made to tolerances of .002 to .003 of an inch. Because of the smooth surfaces obtained little or no finishing such as shot blasting or other types of abrading is required. Productivity is increased per given floor area.

The booklet gives specific information about the various BAKELITE Phenolic Resins especially developed for the process. It includes data also on sand, wetting agents, parting agents, preparation of the pattern, and core making. It is illustrated throughout with a step-by-step photographic description of the "Croning Process" as demonstrated by Bakelite Division at the 1950 Foundry Show.

For your free copy of this booklet, fill out and mail the attached coupon now.

Bakelite TRADE-MARK
Phenolic
BONDING RESINS

BAKELITE DIVISION
UCC

BAKELITE DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

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Bakelite Division, Union Carbide and Carbon Corp.
30 East 42nd Street, New York 17, N. Y.

Please forward at once a free copy of "BAKELITE Phenolic Resins for the 'Croning' Process."

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

DELTA BONDITE*

FOR *SKIN DRY . . .*
DRY SAND . . .
GREEN SAND . . .
MOLDS AND CORES

THE SUPERIOR, WATERPROOF ORGANIC BINDER THAT . . .

Cuts Production Costs!

DELTA BONDITE, the new waterproof organic binder for skin dry, dry sand and green sand molds and cores is a decidedly superior product . . . immediately available in any quantities . . . and considerably more economical to use.

HERE'S WHY . . .

1. Removal of water by heat produces good tensile strength, very high compression and low hot strength.
2. To produce the above properties, no chemical reaction takes place thus resulting in stable sand surfaces on which the molten metal lays kindly.
3. The volatile gases produced by decomposition of BONDITE, ahead of the molten metal, are reducing in nature. This helps eliminate rough casting surfaces, burning-in and metal penetration.
4. Increased dry strength helps reduce buckling, scabbing, penetration and veining.
5. Prevents surface moisture absorption, becomes waterproof on drying.
6. Withstands high torch heat, will not cause edges of skin dry molds to crumble.
7. It is 98% volatile, leaves no excessive ash for sand contamination.
8. Clays, Bentonite, silica flour, fines or old sand have only a minor effect on its binding properties.
9. It is economical to use, reduces cleaning costs and greatly improves casting surfaces and soundness.

* Covered by U. S. Patents No. 2256832 for foundry use.

Ask for a working sample for test purposes and prove its superior qualities in your own foundry applications.

Complete data and specifications on the use of DELTA BONDITE will be mailed to you on request.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

6 big reasons why

it's TIMKEN®...and TIMKEN®...and TIMKEN® again

for heavy-duty conveyors!

Timken bearing equipped troughers have given years and years of service in miles and miles of belt conveyors.

1 PROVEN HEAVY-DUTY PERFORMANCE. Every heavy duty conveyor installation which has 15 years or more service and uses the popular dead-shaft tapered roller bearing construction is equipped with Timken® bearings.

2 EXTRA CAPACITY. Due to line contact between rollers and races, Timken bearings have high load capacity. And because of Timken's tremendous industrial and automotive bearing production which results in low unit cost, it is economical to select bearings with capacity in excess of actual requirements. Result: longer bearing life.

3 FRICTION MINIMIZED. Timken bearings roll freely. Fresh, clean lubricant at regular intervals means no gummy, sticky, jammed bearings.

4 LONGER ROLLER AND BELT LIFE. The friction-free operation of Timken bearings means less sliding and scuffing between idlers and belt. Belts and idlers last longer, require fewer repairs.

5 LONG-LIFE LUBRICATION. Not just lubricated for "life" (which could be very short) but lubricated periodically as conditions require to insure *long* life. The design of Timken tapered roller bearings eliminates the possibility of wear-creating abrasives being trapped within the bearing.

6 MAINTENANCE REDUCED. Timken bearings insure long, trouble-free service, with a minimum of maintenance for the entire conveyor installation.

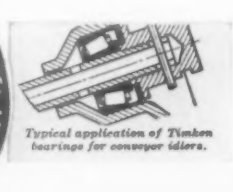
SPECIFY TIMKEN! Major manufacturers of heavy-duty conveyors are ready and willing to supply Timken bearings in their idlers at your request. Insist on Timken bearings and remember, the word "Timken" is not a bearing type but a trade-mark applying to bearings made only by The Timken Roller Bearing Company. Always look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS



Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▱ BEARING TAKES RADIAL ◫ AND THRUST ⊙ LOADS OR ANY COMBINATION ⊙

THESE TESTS PROVE Malleabrasive CUTS CLEANING COSTS up to 50% and more!

Results of four recent Malleabrasive tests conducted independently by four typical foundries.

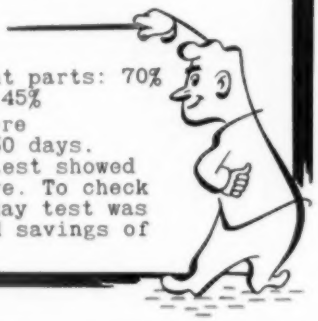
TEST #1

Made by: Cortland Forging Division of Brewer-Titchener Corp.
Total savings with Malleabrasive:

57.2%

Savings on replacement parts: 70%
Savings on abrasive: 45%

Remarks: Two tests were conducted, each for 30 days. Result of the first test showed 35% saving on abrasive. To check results a second 30-day test was run. This test showed savings of 45% on abrasive.



TEST #2

Made by: Reading Gray Iron Castings, Inc.
Total savings with Malleabrasive:

51.8%

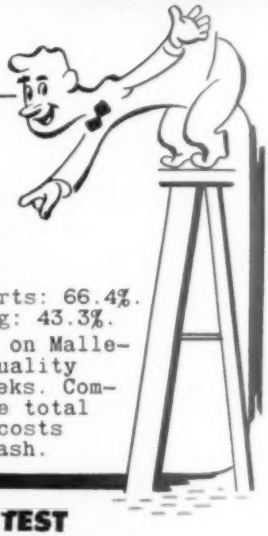
Savings on replacement parts: 64.7%.
Production increased: 25.4%.

Remarks: Test was run for seven weeks. Malleabrasive was compared with standard quality abrasive normally used for this type of cleaning. Test also showed abrasive handling cut by ¼.

TEST #3

Made by: Crucible Steel Castings Co.
Total savings with Malleabrasive:

35.9%



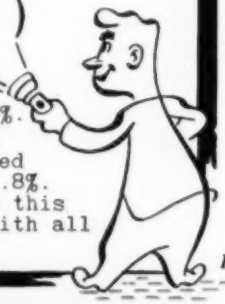
Savings on replacement parts: 66.4%.
Saved on abrasive handling: 43.3%.

Remarks: Comparative test on Malleabrasive and a standard quality shot was run for seven weeks. Computed on a cash basis, the total 35.9% saving on cleaning costs adds up to $5,283.20 in cash.

TEST #4

Made by: Ohio Forge & Machine Corp.
Total savings with Malleabrasive:

58.9%

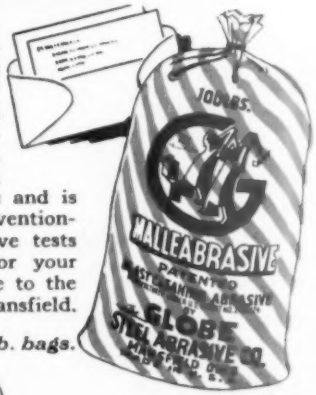


Saved on replacement parts: 81.3%.
Saved on abrasive cost: 43.5%.

Remarks: Using Malleabrasive in the cleaning room increased this foundry's production 12.8%. The comparative test held by this company lasted seven weeks, with all costs carefully recorded.

MAKE THIS AMAZING TEST IN YOUR PLANT!

Comparative tests prove Malleabrasive saves from $500 to $2000 per machine *each year!* We'll send you all the data to make your own test. Remember, Malleabrasive has been tested, accepted and uesd for more than *10 years* and is *guaranteed* to outperform conventional abrasives when comparative tests are properly made. Send for your TEST KIT today! Just write to the Globe Steel Abrasives Co., Mansfield.



Packed in new orange striped 100 lb. bags.

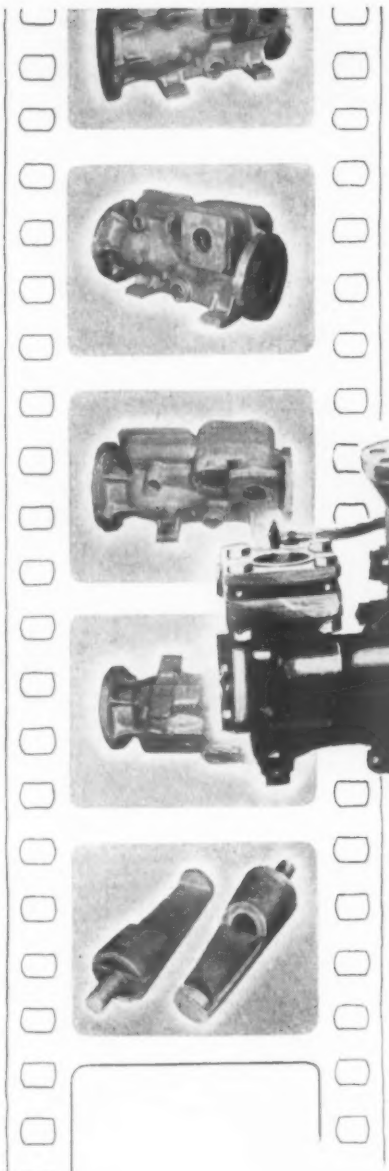
†U.S. Patent #2184926 (other patents pending)

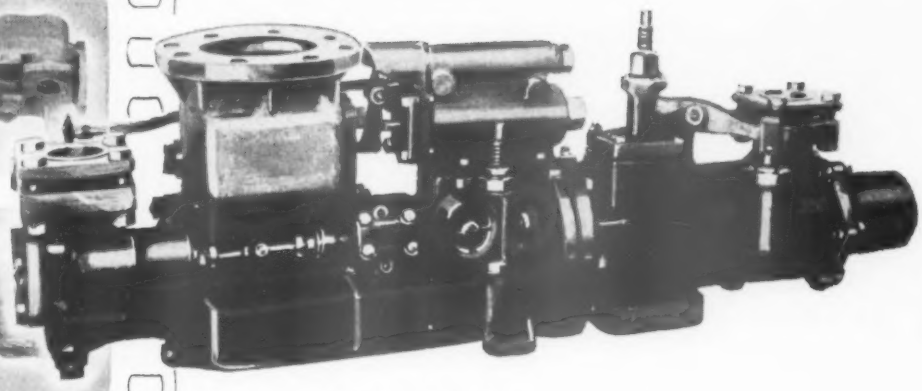
PATENTED† Malleabrasive®

MEMBER FEMA

THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO

· MANUFACTURERS OF METAL ABRASIVES SINCE 1907 ·





Exhaust Steam Injector Body
Courtesy Combustion Engineering-Superheater Inc.

to be sure **COMBUSTION - SUPERHEATER**
uses FEDERATED BRONZE INGOT

When a difficult bronze casting problem faced Combustion Engineering-Superheater Inc., they turned to Federated Metals and the Christensen and Olsen Foundry in Chicago.

C & O and Federated solved the problem. The castings... parts of an Exhaust Steam Injector Body which must be pressure tight and virtually perfect... are made by C & O. Federated copper-base alloys are used because metal of consistent quality is demanded.

Federated metals and Federated service are at your command, too, whenever you have a foundry problem.

See Federated first for any non-ferrous alloy... aluminum, magnesium and copper-base foundry metals; solders; bearing metals; and fabricated lead products.

Federated Metals Division

Federated first in the non-ferrous field FMD

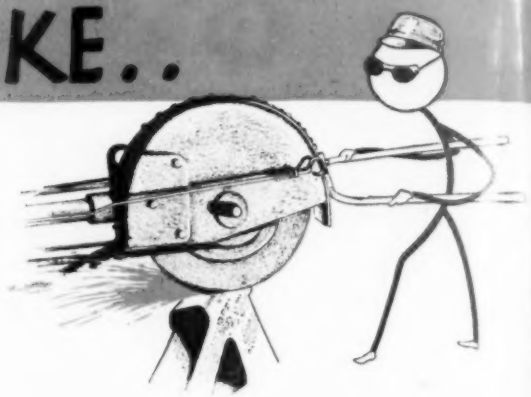
AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

WOULDN'T YOU LIKE..

a wheel that would really snag off metal?

AND

last Forever?



No such wheel has ever been made...

But **we can supply you with wheels that DO offer Maximum Cutting Action and DO have Extra Long Life!**

FAST CUT

If "fast cut" is the primary requirement which spells economy on your particular snagging operations, Norton engineering can furnish you with wheels that fill the bill.

NORTON
ABRASIVES

Making better products to make other products better

LONG LIFE

If "long wheel life" is your particular requirement for economy, Norton abrasive know-how can help you to select exactly the right grinding wheels.

PRODUCT VARIETY

No matter what combination of cutting action and length of life means *maximum economy* on your grinding jobs—Norton Company, with its engineering skill and wide product variety, can fill your requirements. Norton wheels for snagging operations are available with ALUNDUM, 15 ALUNDUM, 57 ALUNDUM and CRYSTOLON abrasives; with B-5, B-7 and BH resinoid bonds and vitrified bond.

You'll find many helpful rough grinding tips and scores of cost-cutting wheel specifications in the Norton booklet, "Rough Grinding." Send today for Form 1405-I

NORTON COMPANY, WORCESTER 6, MASS. • Warehouses in Five Cities • Distributors in All Principal Cities

W-1317

The New Moulders' Friend
FINDS FRIENDS EVERYWHERE

Moulders like The New Moulders' Friend, because the blending action of the rotary wire brush thoroughly mixes and aereates the sand, making it easy for them to put up more and better moulds.

Night crews like it, because it eliminates much manual labor and does a better job of conditioning the sand.

Sand control men like it, because it does such a thorough job of mixing that they really can control the sand.

Maintenance men like it, because it has few moving parts to keep in order.

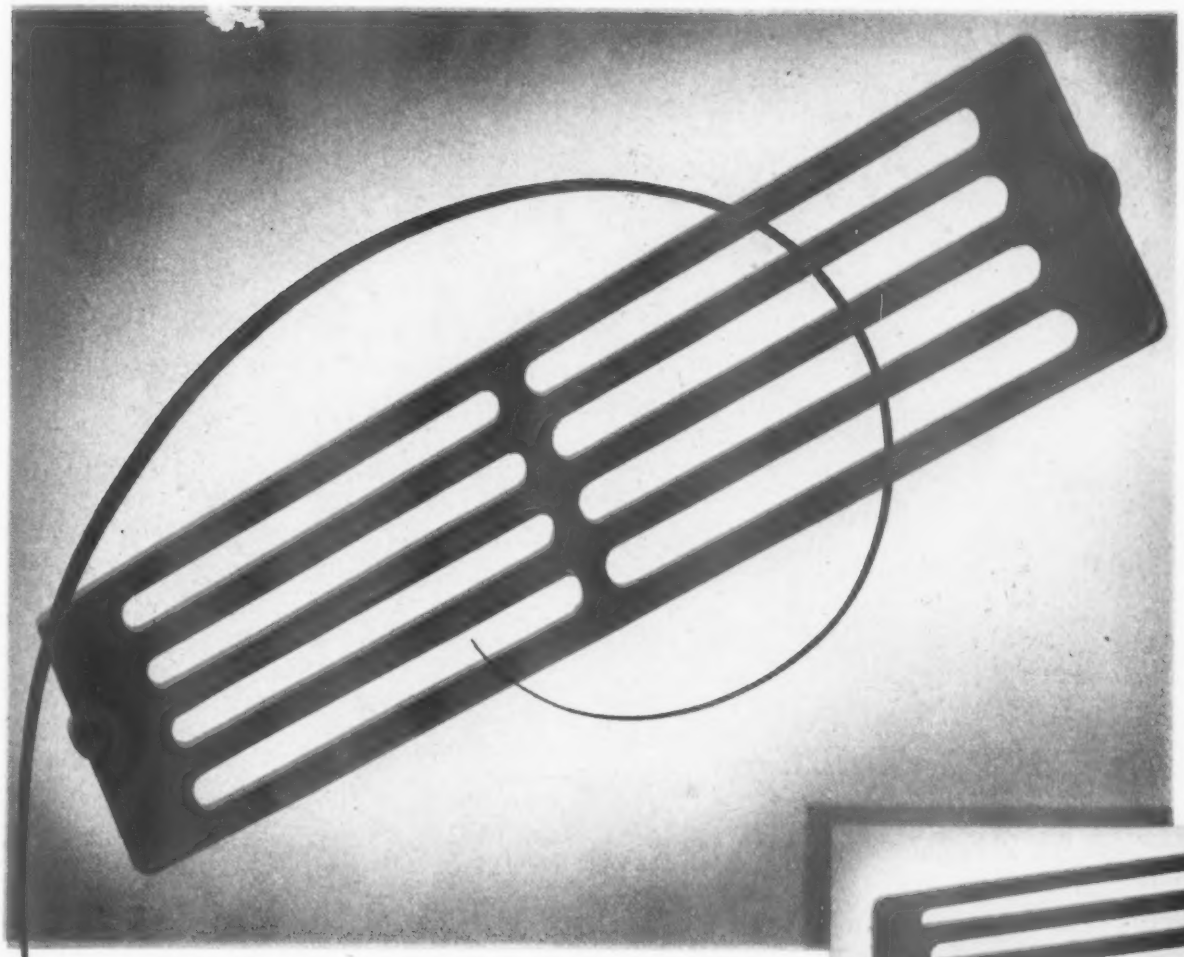
Men who buy castings like it, because it gives them better castings with a smoother finish.

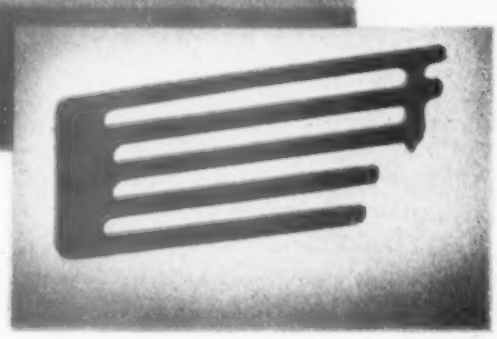
You will like The New Moulders' Friend, because it will decrease your scrap and labor costs and will improve the morale of the men in your foundry.

Begin a profitable friendship with The New Moulders' Friend by writing for further particulars.

"The Moulders' Friend"

Sand Conditioning Equipment
Dallas City, Illinois





No rods or wires

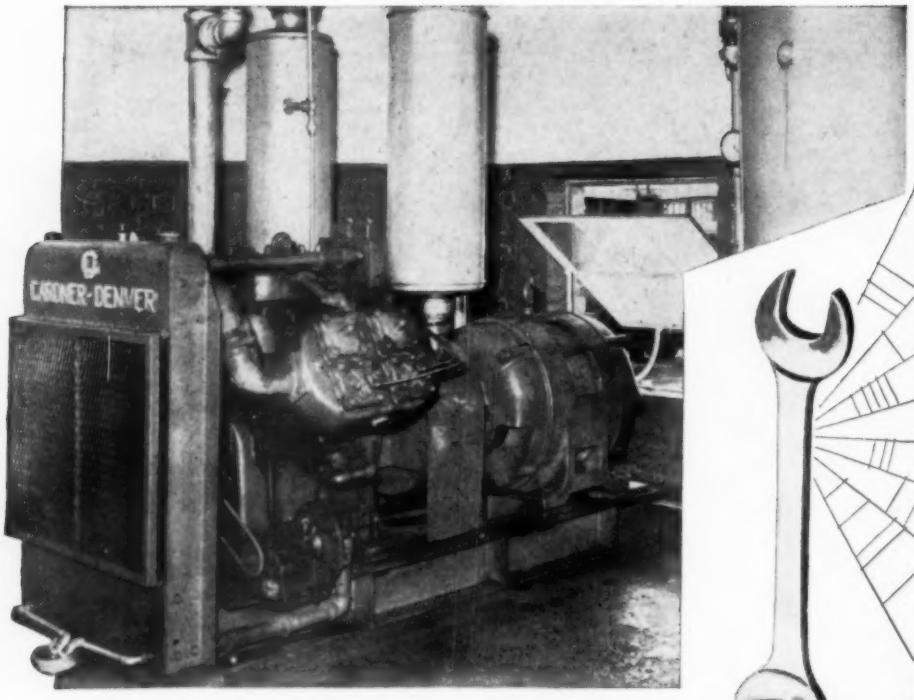
Are you looking for a TOUGHER Core Oil?

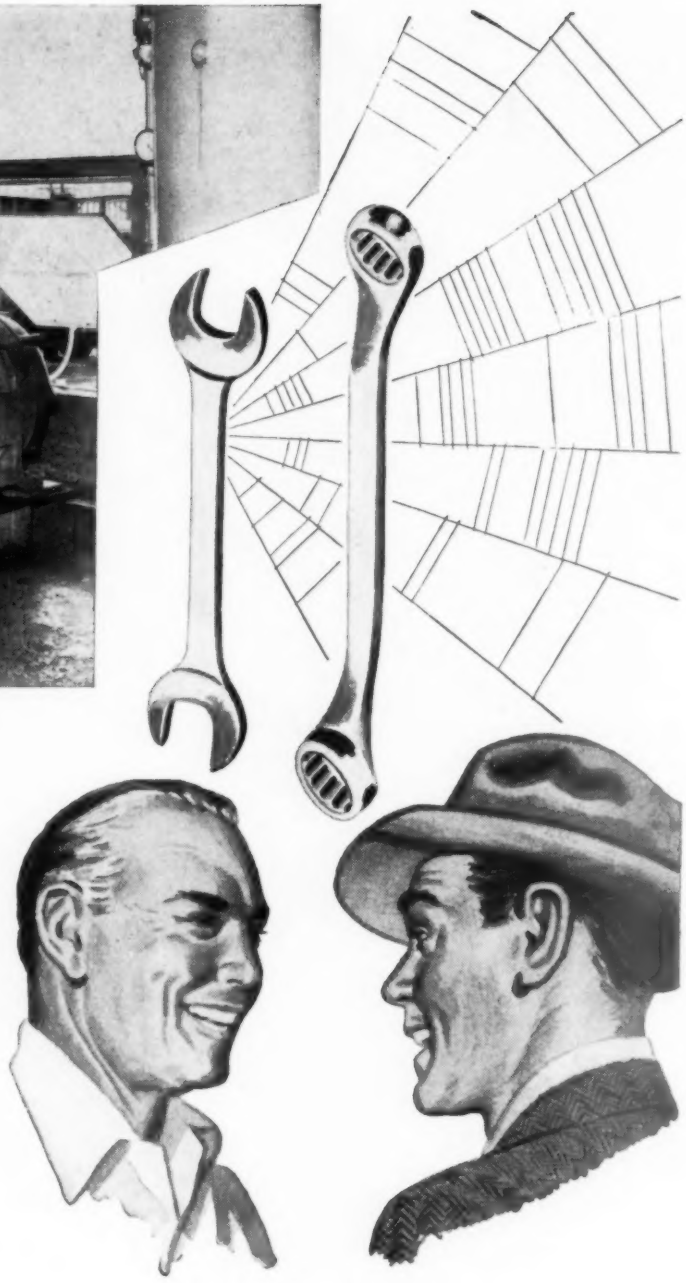
FOUNDRYMEN know that radiator cores are a real test for toughness in core oil. Made without rods or wires, they go through the oven on inset driers, must be knocked loose while hot without cracking, and be cooled at an angle without sagging. For the hard-to-handle job . . . the job that involves conditions pointed out above . . . the toughest and most effective core oil is KORBOND. To prove this, five of the larger radiator plants are consistent users of KORBOND. Try it on your next tough job.

KORBOND
Core Oil
No. 801

UNITED OIL MFG. CO.

1429 WALNUT STREET • ERIE, PA.





"6,552 WORKING HOURS— AND WE HAVEN'T TOUCHED IT YET!"

"Our WB Compressor has now been in operation for a total of 6,552 working hours. A wrench has never touched the machine, and not one single cent has been spent for repairs. We plan to have the valves cleaned soon, but outside of that, the machine is in perfect running order."

—excerpt from owner's letter.

Low maintenance is just *one* of many major advantages in a Gardner-Denver WB Vertical, Two-Stage, Water-Cooled Compressor. You get big capacity, high efficiency air supply in limited space. A self-contained cooling system effectively lowers the discharge temperature—permits operation where good cooling water is scarce. And the WB is a packaged unit, easily installed and ready to go to work.

Gardner-Denver WB Compressors are built in capacities from 142 to 686 cubic feet displacement per minute. Write today for full details.

SINCE 1859

USE COMPRESSED AIR FOR SAFETY CONVENIENCE FLEXIBILITY

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada:
Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

can you use a piece of our mind ?

In this day of specialization no one man has all the answers. Production problems are like huge jig-saw puzzles. Men fit the pieces of their minds together . . . their experience, "know-how", background . . . to provide the practical answers to such problems. Here at *American* we have trained specialists whose talents you may be able to use in completing your production "jig-saws" in the fields of cleaning, dust control, and sand conditioning. We invite you to call on our staff whenever we can be of service.

DUSTUBE Efficiency Proved by Survey

at the

BEACH FOUNDRY
Limited

OTTAWA, CANADA

The Beach Foundry Limited is one of the most modernly equipped gray iron foundries in Canada producing castings for stoves, ranges and furnaces. They also do a wide range of high-specification commercial work for the Electrical, Business Equipment, and Washing Machine Industries.

Mr. I. C. Sheppard
Works Manager

"A recent survey by Independent Engineers, revealed that the dust count in our foundry was within limits considered safe from the hazard of silicosis, and exceptionally low (1 million particles per cubic foot) in our casting cleaning department. Our casting cleaning department . . . is completely exhausted by Dustube Collectors, and presents to operators an equal air condition to that met in the general offices. . . . We have been most pleased with the economical operation and the dependability of the Dustube Collector."

"Dustube Collectors are installed to handle the ventilating of the main sand storage hopper, the return sand to the mulling units, the mullers themselves, and the general area surrounding this mechanical set-up. The elimination of dust from the return and preparation of sand has a great bearing on the general foundry condition. We are planning to extend dust collecting to include the entire mechanical sand and moulding system."

Mr. C. Young
Foundry Supt.

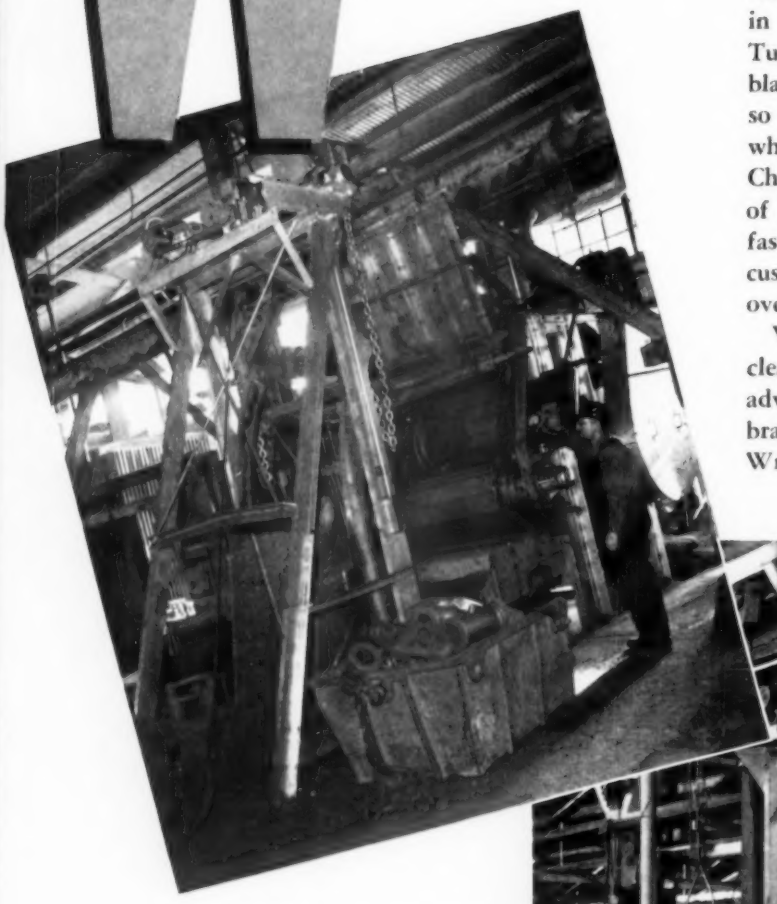
American WHEELABRATOR & EQUIPMENT CORP.
505 S. BYRKIT ST. MISHAWAKA 2, INDIANA

please turn page

WHEELABRATOR

Compare RESULTS and you will see that Wheelabrator Airless Blast Cleaning is the fastest and most economical method in use today. At General Metals Corp., two Wheelabrator Tumblasts replaced a whole battery of tumbling mills and airblast rooms and saved $99.19 every day. The Tumblasts clean so much faster that one man now handles 400 tons a month where two men previously handled only 100 tons monthly. Chipping and grinding have been eliminated entirely because of the thoroughness of Wheelabrator cleaning. Inspection is faster and more thorough. Because the castings are cleaner, customers of the General Metals Corp., report they are saving over 50% in tool life.

Why pay a premium on cleaning machines that only half-clean your work? Let Wheelabrator prove its cost-reducing advantages to your satisfaction. Ask for a test in our Wheelabrator Demonstration Laboratory. There's no obligation. Write today for details.



48"x48" (20 cu. ft. capacity) Wheelabrator Tumblast used by the General Metals Corp. The two machines pictured here replaced a battery of tumbling mills and airblast rooms.

This 36"x42" Wheelabrator Tumblast is used for cleaning malleable castings weighing from ¼ pound to 150 pounds each. Loads weighing 1000 lbs. are cleaned in only 15 minutes.

CASTINGS COST LESS TO CLEAN WHE Y

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

American WHEELABR

please turn page

SAVES $24,048 per year

for General Metals Corporation, Los Angeles, California

CLEANS FOUR TIMES THE WORK WITH HALF THE LABOR

COST COMPARISON SUMMARY

	WHEELABRATOR METHOD	FORMER METHOD
MACHINE	36" x 42" Wheelabrator Tumblast (11½ cu. ft. capacity) 48" x 48" Wheelabrator Tumblast (20 cu. ft. capacity	Battery of tumbling mills and airblast rooms.
PRODUCTION	400 tons per month	100 tons per month
LABOR REQUIREMENTS	1 man, 8 hours daily	2 men, 8 hours daily — 16 man hours
COST PER TON	$3.40	$8.41

SAVINGS	per ton	per day	per month	per year
	$5.01	$99.19	$2,004.00	$24,048.00

YOU USE A WHEELABRATOR MACHINE

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION MEMBER FEMA

WHEELABRATOR & EQUIPMENT CORP., 505 S. Byrkit St., Mishawaka 2, Ind.

MANUFACTURING LICENSEES for Continental Europe: George Fischer, Ltd., Schaffhausen, Switzerland; for British Empire, excluding Canada: Tilghman's Patent Sand Blast Co., Ltd., Broadheath, Nr. Manchester, England. SALES REPRESENTATIVES: Brazil — Equipamentos Industriais "Eisa" Ltda.; Argentina — Clarfix S. R. L.; Mexico — Casco S. De. R. L.; Puerto Rico — Angel Cobiella

please turn page

SAND CONDITIONING HEADQUARTERS FOR 43 YEARS

THE SANDMASTER - DESIGNED WITH THE MOLDER IN MIND

. . . for Fast, *Complete* Sand Conditioning

"Based upon our experience we are satisfied that the Sandmaster incorporates all the design and operating features necessary for providing the molders with perfectly conditioned sand for high quality molding." This is how Mr. W. R. Tanner, President of Zenith Foundry Co., West Allis, Wisconsin, where the first Sandmaster was installed, expressed his satisfaction with this new, better method of sand conditioning.

The molding sand is given a "Velvet-Like" texture by the extra thorough action of the Sandmaster. It not only cuts and mixes the sand but also imparts a mulling action. All tramp iron is removed by magnetic separation. Other foreign particles are removed in the screening process which fluffs, aerates and cools the sand, leaving it in prime condition.

Benefits Obtained with the SANDMASTER *at Zenith Foundry Co.*

Better Sand Quality:

"The fluffy, aerated and cool sand has a feel equal to that of the facing sand we are using." The action of the Sandmaster in mixing sand is most thorough — it is never spotty.

Magnetic Separation:

More than 150 pounds of shot and tramp iron were removed from one pile 30' long x 5' wide by the magnetic separator the first night. From this same pile several days later, another 46½ lbs. of metal were removed. Decreased scrap losses alone will pay for the unit in several years' operation.

Screening:

Particles of coke, charcoal, cores, gaggers, core rods, etc., are effectively removed in the screening process.

Decreased Use of Bond:

"The Sandmaster permits faster conditioning with less bond additions. We have reduced amount of bond needed 50%."

Better Surface Finish:

"We are happy with the improved appearance of our castings — the secret for which can be found in the soft, fluffy well conditioned molding sand."

Only the SANDMASTER provides complete sand conditioning.
Investigate this new, better method. Write for Bulletin No. 45 today.

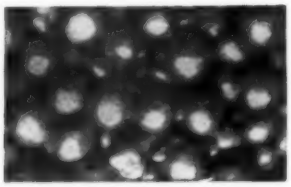
"TRU-STEEL Shot Much Cheaper Than Other Abrasives"

Based on Actual Tests at

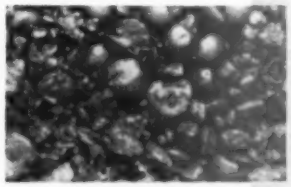
Herschel White Foundry Co., Hillsboro, Ohio

"We use less TRU-STEEL Shot in comparison with the grit and shot used previously. This is merely the initial saving realized as TRU-STEEL has a much longer useful life in itself, and too, we find we have considerable less wear on our Tumblast with repairs and replacements of parts at a minimum. The finish imparted is much superior — it is a great satisfaction to have our customers tell us our gray iron castings are 'beautiful'."

—Mr. L. H. White
Herschel White Foundry Co.



TRU-STEEL
No. 230 at Mag. 10X
After 1,500 Passes



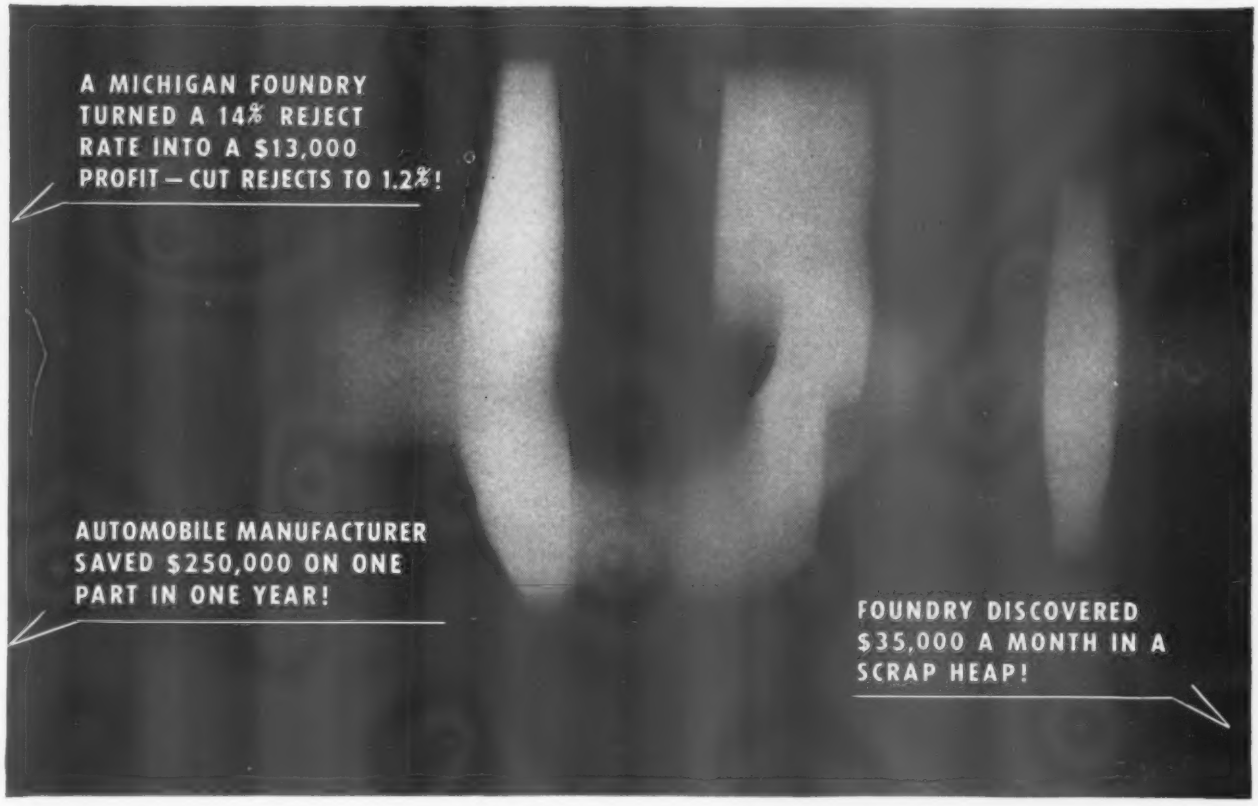
CHILLED IRON
No. 230 at Mag. 10X
After 50 Passes

*TRU-STEEL Shot is manufactured by Steel Shot Producers, Inc., Butler, Pa.

American WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St. MISHAWAKA 2, INDIANA

Please turn page

INDUSTRIAL X-RAY one of management's surest instruments for cutting cost!


A MICHIGAN FOUNDRY TURNED A 14% REJECT RATE INTO A $13,000 PROFIT—CUT REJECTS TO 1.2%!
AUTOMOBILE MANUFACTURER SAVED $250,000 ON ONE PART IN ONE YEAR!
FOUNDRY DISCOVERED $35,000 A MONTH IN A SCRAP HEAP!

General Electric Industrial X-Ray is a production tool that often pays for itself on the first job!

CAMPBELL, WYANT and CANNON, Muskegon, Michigan: "It is estimated that on . . . two jobs alone, the foundry saved over $13,000 and added to its prestige by delivering castings to its customers in which the latter could have the utmost confidence." RADIOGRAPHY — KEY TO BETTER CASTING DESIGN — The Foundry, November, 1944.

FORD MOTOR COMPANY, Dearborn, Michigan: "An outstanding example of the contribution of radiography to the improvement of production processes resulted when examination of one type of crankshaft showed lack of fusion at the chill and pointed the way to improved techniques resulting in a saving conservatively estimated by the company to be $250,000 on a year's production." RADIOGRAPHIC PRACTICE AT FORD — The Iron Age, July 22, 1948.

OBERDORFER FOUNDRIES, INC., Syracuse, N. Y.: ". . . radiography, as proof of soundness, accounted for the salvaging monthly of $35,000 worth of parts, enabling the foundry to meet delivery requirements and, in addition, to increase its yield and pass on to its customer a 20 per cent savings." X-RAY IN POSTWAR ERA — Steel, July 9, 1945.

And so it goes, this story of savings and profit made possible through radiography. Scores of companies have found that radiography has become a *development* tool, too. It not only diagnoses, but suggests treatment. It shows where savings can be made, designs improved, new techniques developed. Write for booklet: "Radiography as a Foundry Tool." General Electric X-Ray Corp., Dept. YY10, Milwaukee 14, Wisconsin.

Find out how you can get x-ray inspection equipment under the GE Maxiservice Plan. No cash outlay. Monthly service charge covers everything. Write for folder.

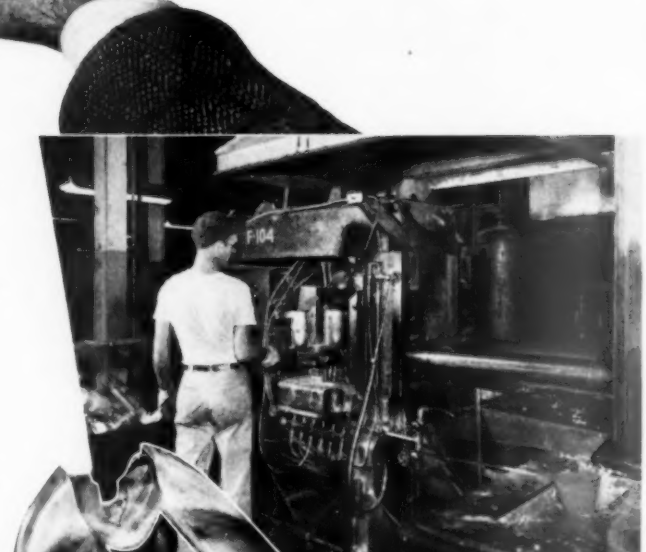
GENERAL ELECTRIC
X-RAY CORPORATION

a bird in hand...

With the foresight and imagination that typifies a progressive company, Speed Queen Corporation of Ripon, Wisconsin, made a careful survey of die casting—*and decided to bring the operation under their own roof—using Lester-Phoenix Die Casting Machines!*

Here's a case where a company with no previous experience used the economy and efficiency of the Lesters to assure them of successful results. Starting with a battery of six Lester-Phoenix Machines, Speed Queen was soon able to say, "... as to rate of production, we are as good if not better than the average field picture and our quality is excellent."

Lester-Phoenix service and engineering personnel will be pleased to help you, too, set up a successful die casting installation in your plant.



Write for your Free Copy of The Lester Press

LESTER-PHOENIX DIE CASTING MACHINES

REPRESENTATIVES

New York . . . . . Steven F. Krould
Detroit . . . . . Thoresen-McCosh
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Cleveland . . . . . Don Williams
Cincinnati . . . Index Machinery Corp.
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St. Louis, Milwaukee . . . A. B. Geers

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London, England . . Dowding & Doll, Ltd.
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Sydney, Australia . . Scott & Holladay, Ltd.
Japan, New York . . W. M. Howitt, Inc.

distributed by LESTER-PHOENIX, INC., 2659 CHURCH AVENUE • CLEVELAND 13, OHIO

This Foundry is A Good Place to Work

Dominion Foundries & Steel, Limited, Hamilton, Ontario

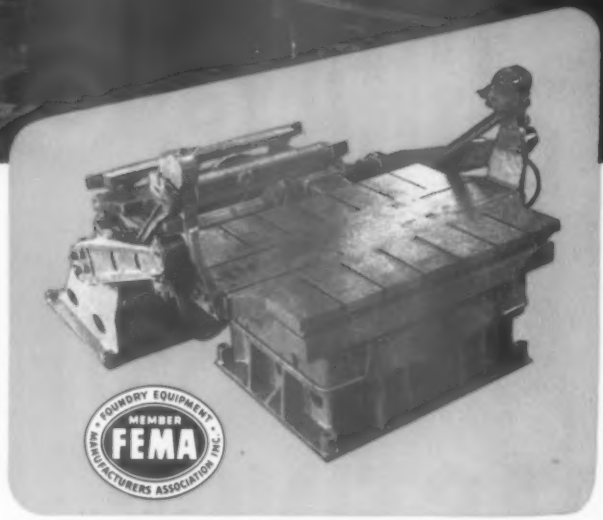
THIS PLANT, started in 1912, is one of the largest steel foundries in Canada. Total plant area is in excess of 40 acres. Total employment is 2500, with approximately 1000 working in the foundry and melting divisions.

Dofasco's foundry has a capacity of 3000 tons of railroad castings per month, typical work being side frames, bolsters, driving wheels, etc.

It is a good place to work because its equipment is modern in every respect. Particular emphasis is placed on sand handling procedure and conveying apparatus.

Also, Dominion has an exceptional labor relations record. Profit sharing, inaugurated in 1937, is now worth $7,500,000.

The Herman 10,000 pound machine illustrated is one of several used by Dofasco to help maintain its reputation as a good place to work.



Efficient, fast, on-schedule production is a natural result.

Herman machines used in this plant, and elsewhere throughout the world, are simple to operate, one valve assuring fast, steady hydraulic action for rollover and pattern draw; no power required for rollback operation; extremely long pattern draw distance.

Herman Molding Machines have made their way by the way they're made.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

Improving Machinability of GRAY IRON CASTINGS

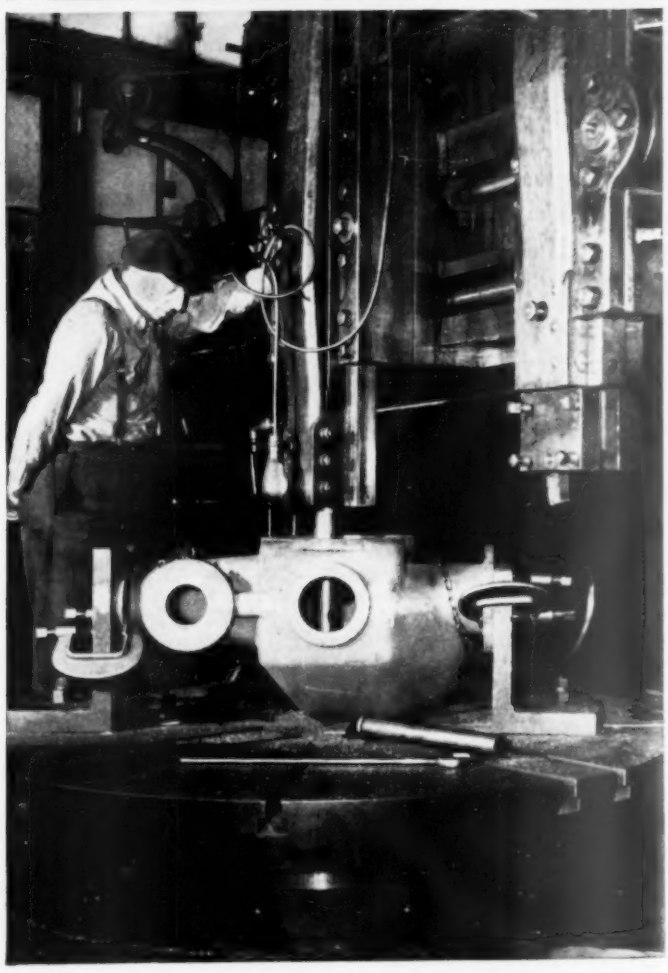
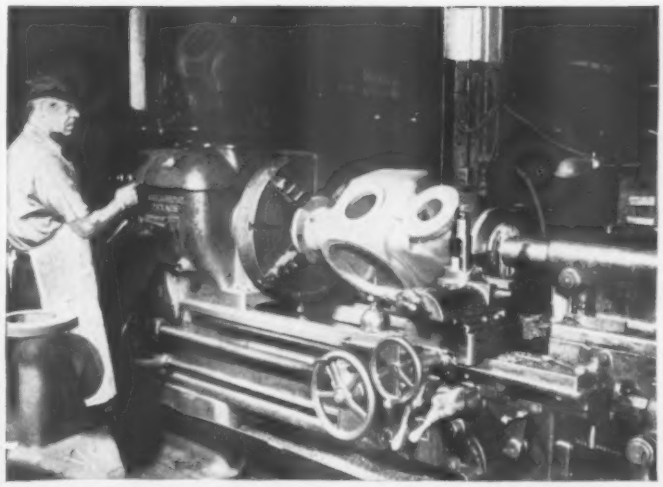
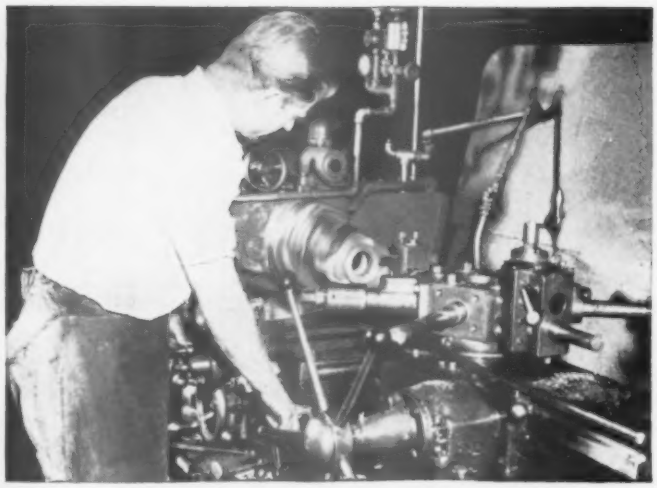


Photo Credit: Photos showing machining of castings, which have been treated with FERROCARBO Briquettes, are by the courtesy of the Rockwell Manufacturing Company, Pittsburgh, Pa. Castings were produced at Monnessen Foundry, a division of Rockwell.





3 IMPORTANT ADVANTAGES

to castings poured from iron which has been deoxidized with FERROCARBO silicon carbide Briquettes are:

1. Reduced machining time
2. Lower tool costs
3. Fewer rejected castings

The net result is realized in lower machining costs and increased profits. Complete detailed information on FERROCARBO Briquettes is easily obtainable from our metallurgical staff.

FERROCARBO Briquettes

BY CARBORUNDUM

TRADE MARK

THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: KERCHNER, MARSHALL & CO., PITTSBURGH, Cleveland, Birmingham, Philadelphia and Buffalo; MILLER AND COMPANY, CHICAGO, St. Louis and Cincinnati; WILLIAMS AND WILSON, TORONTO, Montreal and Windsor.

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company

You asked for it... HERE IT IS—

AO's New Metal Ful-Vue Safety GOGGLE!

HANDSOMER IN APPEARANCE • **STRONGER** IN STRUCTURE

With the introduction of the F4100 Metal Ful-Vue, AO's protection against the impact of flying particles reaches its highest development. Here in one goggle, with or without side shields, workers can obtain the peace of mind which comes from assured safety . . . the utmost in comfort over nose and temples . . . the very finest in EYE APPEAL PLUS EYE PROTECTION!

QUICK FACTS

NEW EYEWIRE — A major contribution to *looks with strength.* Outer edges are square instead of round with a deep groove to hold lenses securely in place. Beaded engraving adds a distinctive touch. The lightweight eyewire is strong and durable.

NEW RUGGED ENDPIECE—Streamlined . . . with a wide bearing surface at hinge which minimizes temple drop. Screw heads are countersunk and flush with endpieces for added good looks, non-sagging security.

NEW LIGHTWEIGHT TEMPLE—Oval temples instead of round for greater comfort and attractiveness. Easily adjusted, perspiration proof. Insulated semi or half tubing is another appearance improver and will outlast life of the temple. Tubing will not come off and it can't be discolored by dirt or grease. Both the temple and endpiece screws are AO patented "Ever-tite" construction . . . they keep tight in service yet remove quickly when replacing lenses.

IMPROVED GUARD ARMS AND BRIDGE — Guard Arms are newly shaped — longer with more opening for added ease of adjustment. The bridge is double braced with four contact joints — a feature found only in AO Ful-Vue spectacle goggles.

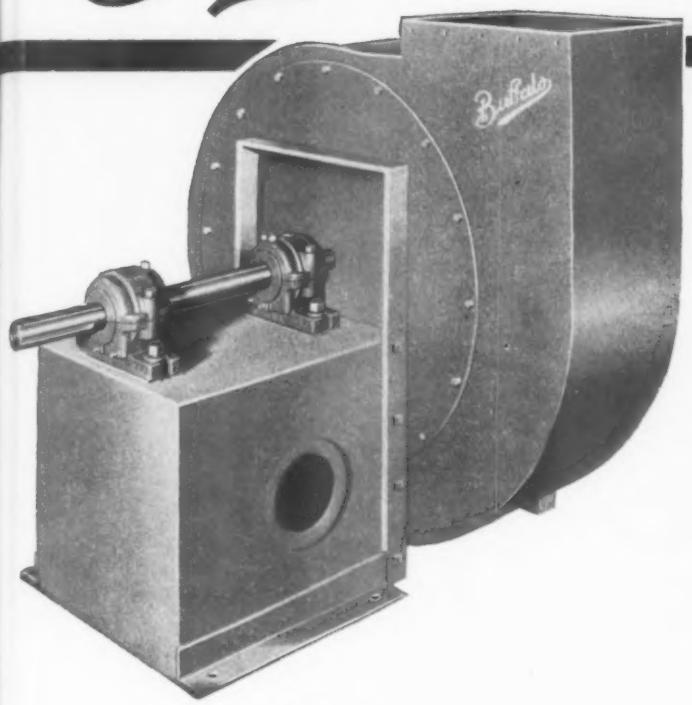
NEW SIDE SHIELD CONSTRUCTION — A real time saver . . . new one-piece binder and eyewire construction *eliminates necessity of inserting the screen before inserting lenses!* Replacement of lenses can now be made without any interference with or from the side shield.

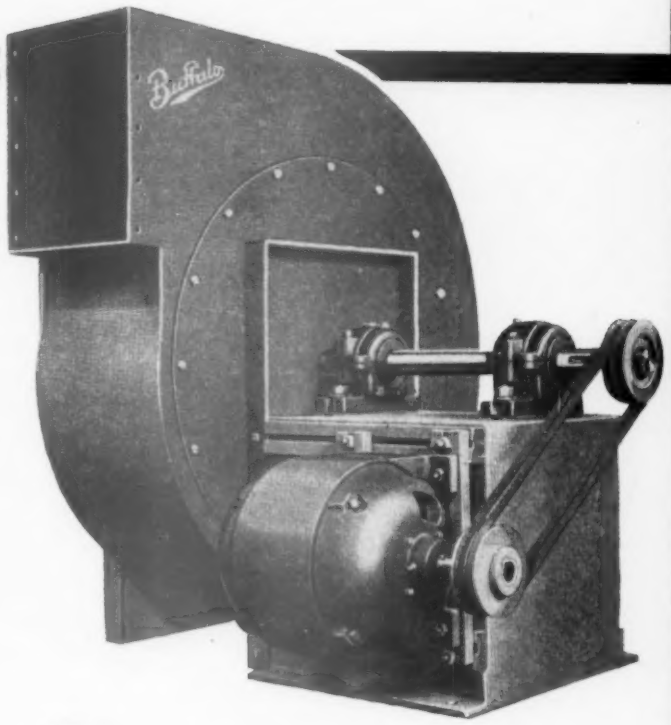
For these and many other reasons, be sure to see the new F4100. YOUR NEAREST AO SAFETY REPRESENTATIVE CAN SUPPLY YOU.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

"Buffalo" INDUSTRIAL EXHAUSTERS for Heavy Duty Service





1 EXHAUSTING AIR *Efficiently*

"Buffalo" Industrial Exhausters with type "AW" Air Wheels give you exceptionally high efficiencies in removing air and gases of many types. Of all-welded steel plate, these fans are rugged for heavy duty, and their smooth housings and wheel surfaces mean less friction because of absence of rivets. Housings are adjustable to any desired position of discharge. Four arrangements are available, both belted and direct drive, and models are available for hot or corrosive gases. Economical and easy to maintain, these fans are good for many years of 24-hour service.

2 MOVING MATERIALS

Type "MW" and "AW" wheels are interchangeable on "Buffalo" Industrial Exhausters, another advantage in this popular line. With "MW" Material Wheels, they are often your cheapest method of handling chips, emery dust, etc. Blades are *shaped* for efficiency, unlike paddle wheel type, and rugged back plate is welded to blades for extra rigidity and strength. For economy in any exhausting job you have, look to "Buffalo", the kind foundries have been depending on for years.

WRITE FOR BULLETIN 3576-A

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

221 MORTIMER ST. BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont., Branch Offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

NEW B&W ALLMUL FIREBRICK

Designed to Cut Furnace Costs

Now you can have the heavy-duty firebrick you always wanted . . . a practically pure mullite brick that costs far less than similar heavy-duty refractories.

It's the new ALLMUL Firebrick, designed to slash refractory costs by **eliminating frequent need for furnace relining**, by **cutting maintenance** and **saving valuable production time.** In fact, ALLMUL is designed to give you a new standard of economy and performance in furnace construction and operation.

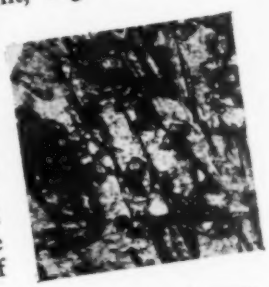
If you are now using all-mullite type refractories, you will be surprised by the low initial cost of ALLMUL . . . at the over-all savings you can make with this practically pure mullite firebrick.

If you are using part-mullite refractories with the thought that top quality mullite refractories cost more than you could afford to pay, economical B&W ALLMUL Firebrick is well worth investigating.

ALLMUL shows no spall loss in the rigorous spalling test, in which firebrick—after first having been heated to 3000 F for 24 hours—is alternately heated to 2550 F and chilled in an air-water blast for 12 cycles.

WHAT IS MULLITE?

Mullite—a crystalline compound with the formula $3Al_2O_3 \cdot 2SiO_2$—is the *only* compound of alumina and silica stable at high temperatures. It's the ingredient which potentially gives firebrick a high melting point, high hot load strength, high resistance to spalling, and good volume stability. But unless ingredients are properly selected, proportioned and processed, mullite crystals are small, widely separated and often embedded in a matrix of silica. The valuable properties of mullite are thus lost.



ALLMUL, on the other hand, is nearly all pure, tough, interlocking mullite crystals, with a small amount of highly durable corundum, as shown in the photomicrograph, and it contains no free silica. This accounts for the truly amazing strength and heat resisting properties of ALLMUL.

Many Applications for NEW B&W ALLMUL

If heat is the heart of the operation, you'll find new B&W ALLMUL makes possible important economies. For example, ALLMUL can be used in glass tanks of all kinds; ferrous and nonferrous metal furnaces; ceramic kilns; enameling furnaces; chemical and petroleum furnaces; and in many other applications. Even under the most punishing service conditions, ALLMUL Firebrick withstands heavy loads and high temperatures. See how ALLMUL can cut refractory costs in your specific application.

NEW 4-page Bulletin gives you all the facts about ALLMUL Firebrick. Just clip coupon and mail today.

See ALLMUL at the METAL SHOW October 23 to 27

THE BABCOCK & WILCOX CO. • REFRACTORIES DIVISION • 85 LIBERTY STREET • NEW YORK 6, N. Y.

☐ Please send a copy of your new bulletin R-29 on ALLMUL Firebrick.

☐ I would like to see a B&W Refractories Representative.

NAME_____

COMPANY_____

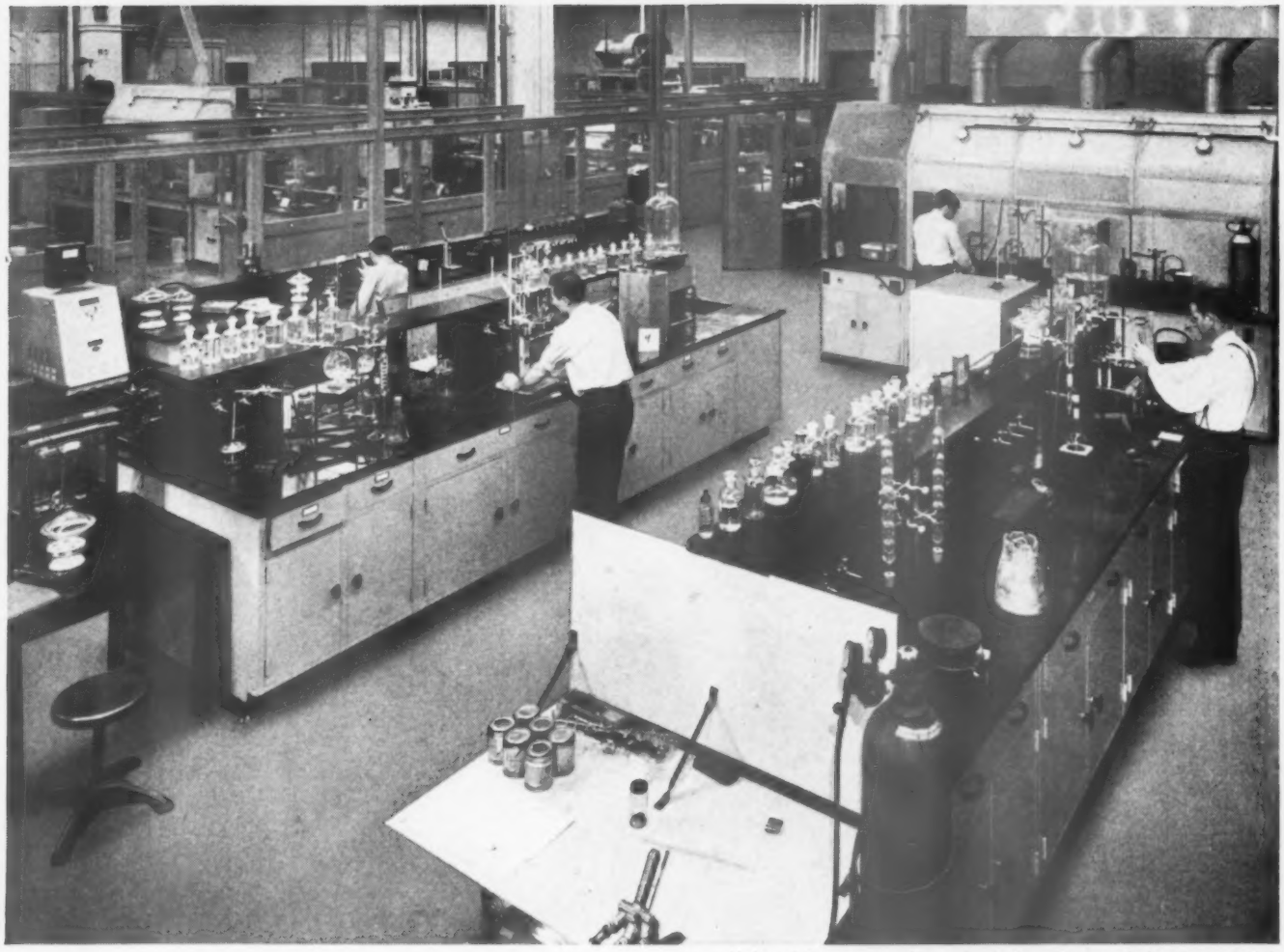
ADDRESS_____

CITY_____

STATE_____

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST, NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.



Making laboratory analyses of grinding wheels and abrasive materials

This is your grinding wheel laboratory

This is just one corner in the immense research and development laboratories of United States Rubber Company at Fort Wayne, Indiana.

Here "U. S." Abrasive Engineers work to lower your grinding wheel costs. They delve into every phase of bonds and abrasives, developing wheels that are more economical for snagging castings.

Their development work has revealed 5,000,000 possible combinations of size and construction. This means that they can produce the exact wheels you need for your conditions.

Take advantage of the "U. S." grinding wheel service. Write to address below.

MADE ONLY BY

U.S.RUBBER

SERVING THROUGH SCIENCE

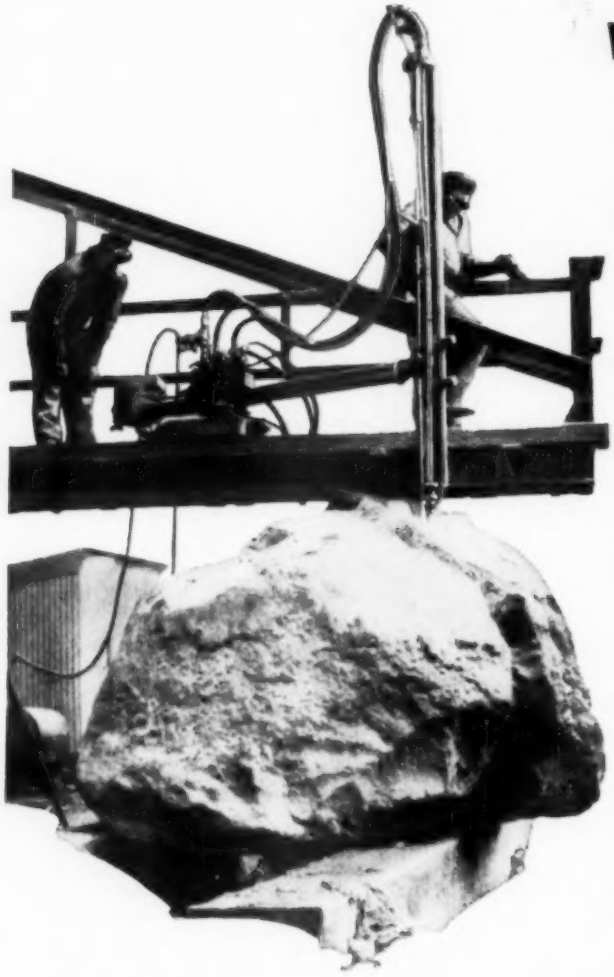
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Get in ALL Your Scrap---Profitably

with OXWELD Equipment

Trade-Mark



Here's the OXWELD *C-60 Cutting Blowpipe in action . . . slicing up a steel button 6 ft. thick with ease!*

Oxygen cutting rapidly converts steel sections of every size, shape, and type into good, usable scrap. Any thickness is easily reduced to charging-box size with OXWELD equipment. And no job is too tough. Whatever your scrap-cutting problem, there's an OXWELD blowpipe to solve it efficiently and economically.

For the extra-heavy jobs, the OXWELD C-60 Cutting Blowpipe with powder-cutting attachment is the answer. Especially engineered for cutting spills and ladle skulls, this combination easily makes continuous cuts through 6 ft. of dirty, slag-incrusted steel.

Other highly adaptable OXWELD blowpipes speed up medium scrapping operations. Mounted on portable, lightweight machines, they work on a production basis, cutting ingots, castings, and risers into sizes convenient for charging into the furnace.

On the lighter jobs, sturdy OXWELD hand-cutting blowpipes ready steel scrap up to 12 in. thick for the charging box. With 57 different nozzles to choose from, you get maximum efficiency at lowest overall cost.

LINDE has accumulated a vast amount of practical experience in helping to solve many unusual scrapping problems. If you have a scrap-cutting problem, ask our nearest office for help. We have the know-how, the "show-how," and everything you need to do the job profitably.

The term "Oxweld" is a registered trade-mark.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N.Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

A lightweight OXWELD *portable machine speeds this scrap-cutting operation. Setup is semi-automatic and portable . . . can be easily moved from one job to another.*

Spills, salamanders, and other mill scrap can be cut quickly and efficiently with an OXWELD *hand-cutting blowpipe . . . and with minimum gas consumption.*

FOUNDRY QUESTIONS?

. . . ask the man who carries this bag!

YOU'LL GET the right answers, that's sure—for this man is your Republic Pig Iron Metallurgist. You can depend on him for advice. He knows his irons—all their melting, pouring, casting, finishing characteristics. He's wise in the ways of production, too—qualified by long years of on-the-job, in-the-foundry experience.

Ask him in for a question session, or for a routine foundry survey. He likes to talk shop—but never out of turn. Your confidence will be respected.

If you've questions to ask—his answers will be factual: backed by personal knowledge and the research and study of Republic's entire Metallurgical Staff.

No questions, just a routine survey—may lead to practical, workable suggestions for cost-cutting that you can profitably put into operation.

Large and small foundries alike call on him regularly for advice and help. Why not follow their example and make use of his services yourself. There is no charge, no obligation on your part. Just let us know when you want him to call. He'll be there.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic PIG IRON

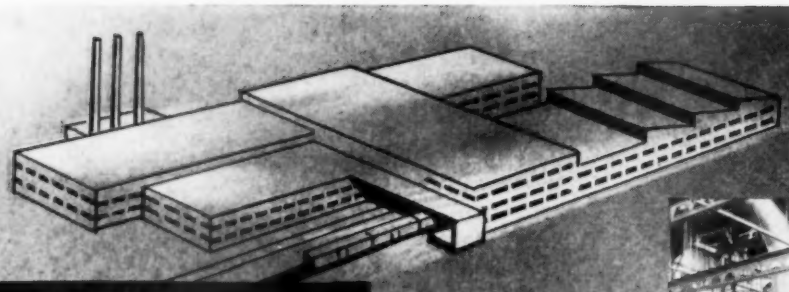
"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS



DESIGN
FABRICATION
INSTALLATION

"for all three call K&B!"

For 42 years, Kirk & Blum has specialized in the DESIGN, FABRICATION and INSTALLATION of efficient, dependable systems for the removal of dust and fumes.

DESIGN: Kirk & Blum engineering specialists survey your plant and then design your system, selecting equipment most suitable for your problem.

CONSTRUCTION: Kirk & Blum fabricates the complete system (equipment excepted), "tailor made" for your installation.

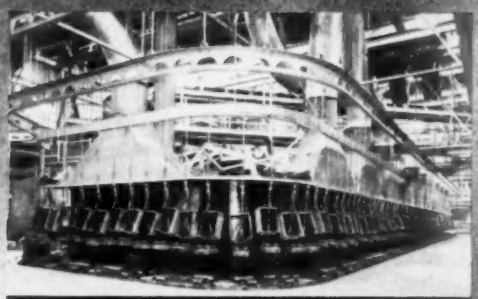
INSTALLATION: The Kirk & Blum contract includes responsibility for the entire system, installed by mechanics with years of specialized experience in the installation of such systems. As a result, you have one undivided responsibility —one complete contract for an installed system, ready to operate.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

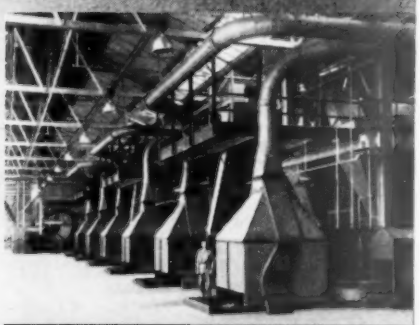
KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

THE KIRK & BLUM MFG. COMPANY
2800 SPRING GROVE AVE.,
CINCINNATI 25, OHIO



View in new Southern Foundry, shows pouring station with K & B system which removes smoke and fumes as they are formed.



"Shakeouts" in the foundry of a noted implement firm equipped with K & B Dust Control System.

Another K & B system for production line shakeouts. Note that Dust Control equipment does not interfere with production.

K & B Plenum Chamber Hood for mold conveyor operation. Note bolted section construction for ease of maintenance.

UNIVERSAL FLASK PINS

STAND PLENTY OF PUNISHMENT . . .

THUS SAVE REPLACEMENT TIME AND COST

Universal Flask Pins and Bushings are made to really stand up no matter how much punishment they're given in the foundry. They seldom break or bend—in spite of the beating they take on the shake-out. The bushings show a minimum of wear despite continuous use.

The reason: Universal Flask Pins and Bushings are heat-treated and precision ground from high quality steel with the same close tolerances found in machine tool work. Because they stand up, Universal Bushings and Pins save the cost and the down-time that replacement always requires. Because of their precise design and construction, Universal Bushings and Pins allow perfect cope and drag alignment. And because all standard sizes are carried in stock you get prompt delivery. Special sizes and types to order. Complete information is available by requesting the Universal Catalog covering Flask Pins and Bushings. Direct your inquiries and orders to the office nearest you —1060 Broad St., Newark, N. J., and 5035 Sixth Ave., Kenosha, Wisconsin—or write to our home office.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 4, MICHIGAN

Grinding Wheels

for low cost snagging

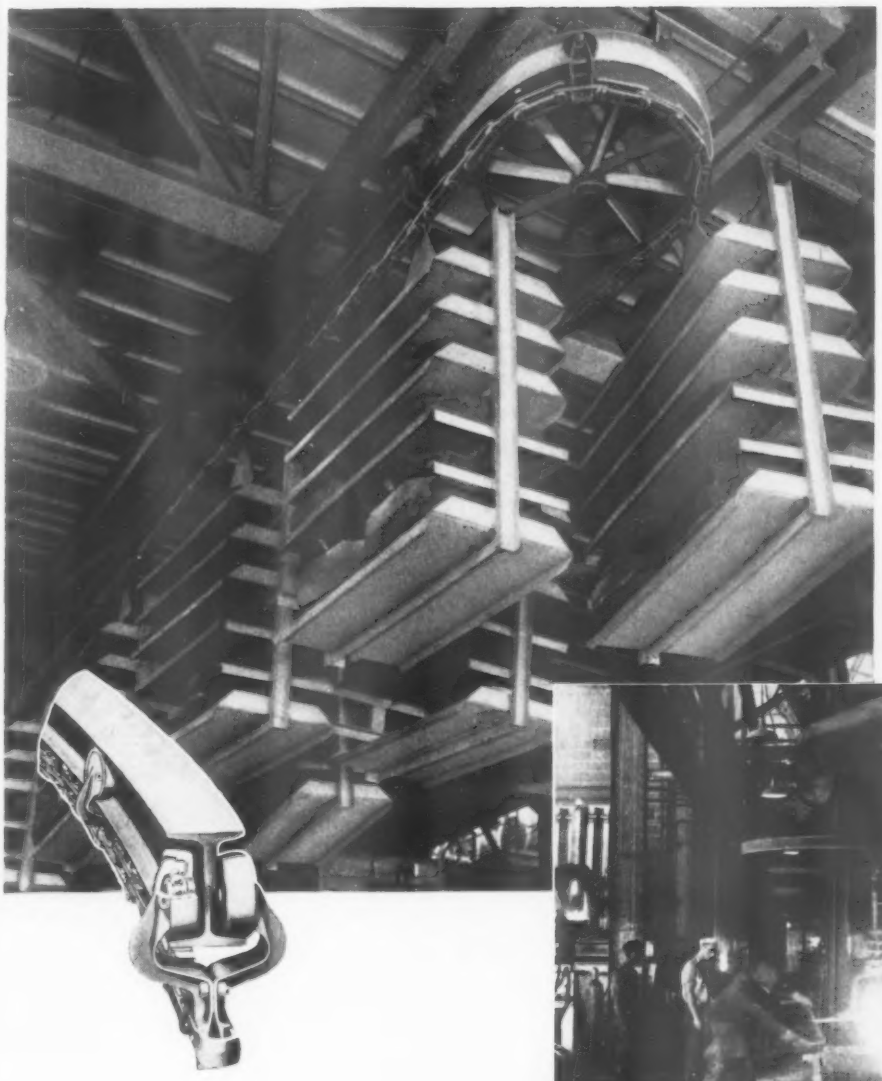
Fast stock removal at low cost! It's yours with Simonds Grinding Wheels on your swing frame and floor stand grinders . . . biting into the toughest metals . . . standing up to the severest strain of rough snagging . . . giving maximum tonnage ground.

Special advantages of exclusive patented Red Streak Flanges on large hole resinoid bonded wheels assure extra savings through less machine wear and lower maintenance cost. Find out how this efficiency can be yours on every grinding job. Write for informative Data Book listing your nearest Simonds Abrasive distributor.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

DIVISION OF SIMONDS SAW AND STEEL CO., FITCHBURG, MASS. OTHER SIMONDS COMPANIES: SIMONDS STEEL MILLS, LOCKPORT, N.Y., SAW CO., LTD., MONTREAL, QUE. AND SIMONDS CANADA ABRASIVE CO., LTD., ARVIDA, QUE.

Is your foundry "ceiling zero?"



LINK-BELT *OVERHEAD TROLLEY CONVEYORS* put your ceiling to work... save valuable floor space

Link-Belt Overhead Trolley Conveyors travel up, down or around at synchronized speeds to assure your foundry scheduled "straight-line" production regardless of physical layout.

A conveyor system can be quickly installed in your foundry for pouring molds on the run . . . smooth handling of castings from molding stations to shipping . . . transporting cores to foundry operation . . . dumping sprues automatically at discharge stations and other cost, time and space saving uses.

An experienced Link-Belt foundry engineer will be glad to help you in applying overhead conveyors to your present plant set-up. Ask him today.

Upper left: Cores making corner turn on Link-Belt overhead trolley delivery conveyor.

Above: Pouring molds on the run without danger to workers and with minimum scrap loss is a common practice when using smooth, steady Link-Belt Overhead Conveyors.

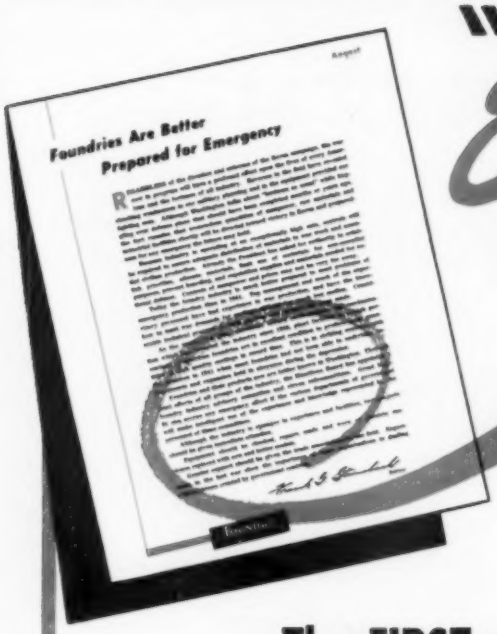
12,081

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

LINK-BELT

OVERHEAD TROLLEY CONVEYORS



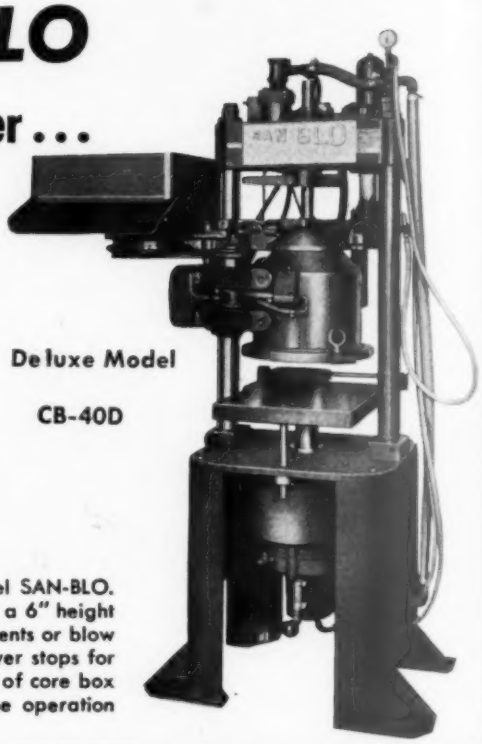
"Equipment should b[illegible] obsolete machines rep[illegible]

The above statement was made by Editor Frank G. Steinebach in his editorial on the present War Emergency, which appeared in the August issue of THE FOUNDRY.

SAN-BLO

The FIRST all-purpose sand blower...

- ✓ **1. Blows all kinds of core sand**
  dry core compound, oil sand or facing sand for green topping.
- ✓ **2. Blows high strength sand**
  successfully blows sand of any green strength up to 8 lbs.
- ✓ **3. Blows high moisture sand**
  successfully blows sand of any moisture content up to 8%
- ✓ **4. Blows large and small cores**
  single cores up to 40 lbs. each, or 40 lbs. of small cores without refilling or moving blow head
- ✓ **5. Blows all types of core boxes**
  open or closed, wood or metal—use your present equipment.

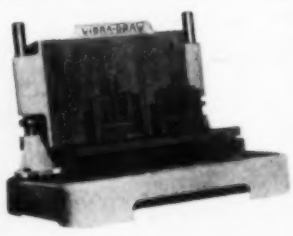


Deluxe Model

CB-40D

Position core box and press valve—that's all you do with the Deluxe Model SAN-BLO. Self-adjusting table with 6" stroke permits blowing assortments of boxes with a 6" height range (such as 4" to 10", 6" to 12" etc.) CONTINUOUSLY—without adjustments or blow plate changes. And because blow head holds 40 lbs. of sand, there are fewer stops for re-filling. Cores are blown as fast as you can get boxes in and out! One half of core box can be fastened to blow plate and can be drawn, thereby eliminating one operation and speeding up production.

VIBRA-DRAW Core Drawing Machine



With any core blower, you make cores only as fast as you draw them. VIBRA-DRAW draws cores as fast as SAN-BLO makes them. Simply place core box against vibrating head and lift box—a perfect core every draw—and fast!

WHIRLMIX Sand Mixer

The first and only mixer with flexible, whirling, rubbing arms. Produces fluffy, aerated, thoroughly mixed sand without overheating, or crushing sand grains. Small, compact, easily-moved—yet a big producer, for it mixes 4,000 lbs. of sand per hour.

Federal Foundry Equipment

...checked, repairs made *and* worn or ...*ced* with new *and* better models"

FEDERAL IS READY TO TAKE CARE OF YOUR EQUIPMENT REQUIREMENTS

CLIMAX WIRE STRAIGHTENER

Now with wire hard to get, it's more important than ever before for foundries to straighten and re-use wires and rods. The CLIMAX Wire Straightener is the ideal machine for this important job.

1. Straightens random lengths of wires and rods
2. Can be operated efficiently by unskilled labor
3. Operation is safe, simple and fool-proof
4. A wide variety of models is available

Model 2 handles 4 wire sizes from 1/16" to 1/4". Model 2½, 4 sizes, from 3/16" to ½". Model 3, 5 sizes from 1/4" to 3/4". Each model can be furnished with (1) extended shaft for your own drive, (2) with speed reduction unit for your motor, or (3) completely motorized.

"An Old Friend"

The CLIMAX Wire Straightener has been an old friend in many foundries. Picture at left shows one of the models in use more than thirty years ago. CLIMAX machines have been improved and modernized to guarantee efficient operation.

Model 2A—Motorized

LOWE Electric Sifter

The LOWE Electric Sifter features greater screening area, enclosed ball bearing motor, more shoveling room, rugged construction and trouble-free operation. It will save time and money for you, through faster sifting and better sand conditioning. Write for descriptive circular and prices.

SHUR-SPOT Sprues

For use on squeezer-made molds. SHUR-SPOT squeezes down with the sand. When squeezer board is removed, SHUR-SPOT pops up to be lifted out. The result is a fully completed and properly located pouring sprue, requiring no finishing. Write for complete information and prices.

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Sales Offices: CHICAGO • DETROIT • MILWAUKEE • NEW YORK • CHATTANOOGA • RICHMOND, VA. • LOS ANGELES

TAM* Zircon grog type ramming mix

Linings always last over 200 heats at Induction Steel Casting Company

Tapping Heat from 1000 lb. Allis-Chalmers Induction furnace at Induction Steel Casting Co.

*TAM zircon lining after drying out...ready for first melt.

Furnace ready for relining after 261 heats.

The experience of Induction Steel Casting Company of East Detroit, Michigan is typical of the extended lining service life that can be expected from TAM* zircon grog type ramming mix. Their lining life is always over 200 heats.

The 1000 lb. induction furnace shown here was used to melt 261 heats before relining was required. During this period, S.A.E. 1025 and 1030, 12% Cr. —1½%C., 4630, 6145 and die steel containing .50C. and 1.0% Cr. were the alloys poured.

This long service and resultant increased furnace efficiency is due directly to the excellent resistance of TAM* lining material to high temperatures and erosive action. It explains why more metal is melted at less cost per ton when TAM* ramming mixes are used.

Detailed facts on TAM* ramming mixes may be obtained from our field engineers or by writing our New York office. It will pay you to have these facts.

TAM PRODUCTS
Registered U. S. Pat. Off.

*TAM is a registered trademark

TITANIUM ALLOY MFG.. DIVISION
NATIONAL LEAD COMPANY

Executive and Sales Office: 111 BROADWAY, NEW YORK CITY · General Offices, Works, and Research Laboratories: NIAGARA FALLS, N.Y.

REACHING the HEIGHTS in Performance

SMITH L-O CORE OIL

Here is the Dow-Therm* processed oil . . . the core oil that is tops in uniformity, easily mixed, excellent in workability. And, to assure superior results under *your* casting conditions, it is available in a wide range of grades to suit the type of sand used and kind of metal cast. Hit a new high in your core-making production with tested and proved Smith L-O . . . the quality core oil that gives results that speak for themselves.

* *The only core oil processed by this indirect fire method of heat treatment.*

WAREHOUSE STOCKS AVAILABLE
In The Following Cities

- COLUMBIAN WAREHOUSE CO. — Reading, Pennsylvania
- FOUNDRY SERVICE CO. — Birmingham, Alabama
- E. R. FROST CO. — Minneapolis, Minnesota
- F. F. SHORTSLEEVE — Elmira, New York
- MALCOLM G. STEVENS — Arlington, Massachusetts
- PACIFIC GRAPHITE CO., INC. — Los Angeles 22, California
- TERMINAL WAREHOUSE — Worcester 8, Massachusetts
- M. W. WARREN COKE CO. — St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. — Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. — Portland 14, Oregon

Smith L-O Core Oil

ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
MANUFACTURERS OF L-O AND CERTIFIED CORE OILS
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

For Greatest Efficiency
At Lowest Cost

DESULFURIZE
with
SODA ASH

For a Quality Soda Ash
At No Extra Cost

Specify **SOLVAY**
Trade-Mark Reg. U. S. Pat. Off.

DENSE SODA ASH

Especially Designed for Desulfurization

★ MEDIUM GRAIN SIZE ★ DUSTLESS ★ HIGH CHEMICAL PURITY

Simple, efficient, low-cost equipment for automatically feeding Soda Ash into molten iron for desulfurization is now available. We will be glad to supply detailed information concerning this equipment and its installation upon request.

SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Can You Top This?

The Chemalloy Foundry Company of Louisiana, Missouri, speaks for M C Dip-Out Furnaces

Here is actual proof of the economy that Stroman M C Reverberatory Dip-Out Furnaces for aluminum effect in actual operation. They are a combination of melting and holding furnaces that produce the highest quality casting and always have hot metal available for dipping. They are ideal for permanent mold, die casting, or sand casting plants. Bath capacities range from 500 to 10,000 pounds. Jim Maddern of Chemalloy says the rest. Install a Stroman M C in your plant and turn these savings into profits, while making working conditions much more pleasant for your men!

CHEMALLOY FOUNDRY COMPANY

ALUMINUM — BRONZE — BRASS CASTINGS
PERMANENT MOLDING

LOUISIANA, MISSOURI

June 14, 1950

Mr. J. L. Stroman
Stroman Furnace & Engineering Company
9900 Franklin Avenue
Franklin Park, Illinois

Dear Mr. Stroman:

We have just finished checking costs with our auditing department and have come up with some astonishing facts and figures which to us are pleasing to say the least. So, I am passing them on as I am sure you would like to know how your furnaces compare to others.

The M C Reverberatory Aluminum furnace we bought from you a year ago certainly was the finest investment we ever made. Here are actual costs of operation on the M C and former pot equipment for one year on a production schedule of a monthly melt of 200,000 lbs. with a 100,000 lb. yield. We found that pot furnaces cost us as follows:

Pots	$5200.00
Fuel	5400.00
Direct Labor	8000.00
Indirect Labor	2750.00
Total	$21,350.00

The one M C we are now operating to replace the pots costs as follows:

Refractory Lining	$ 400.00
Fuel	2400.00
Direct Labor	6000.00
Indirect Labor	470.00
Total	$9270.00

That this saving of $12,080.00 in one year's time with one furnace, makes us very happy is needless to say. Also, our men find it much easier to work with and around, and it gives us a happier personnel.

Congratulations on the design of such a fine piece of equipment, and you can bet from now on all our furnaces will be Stromans.

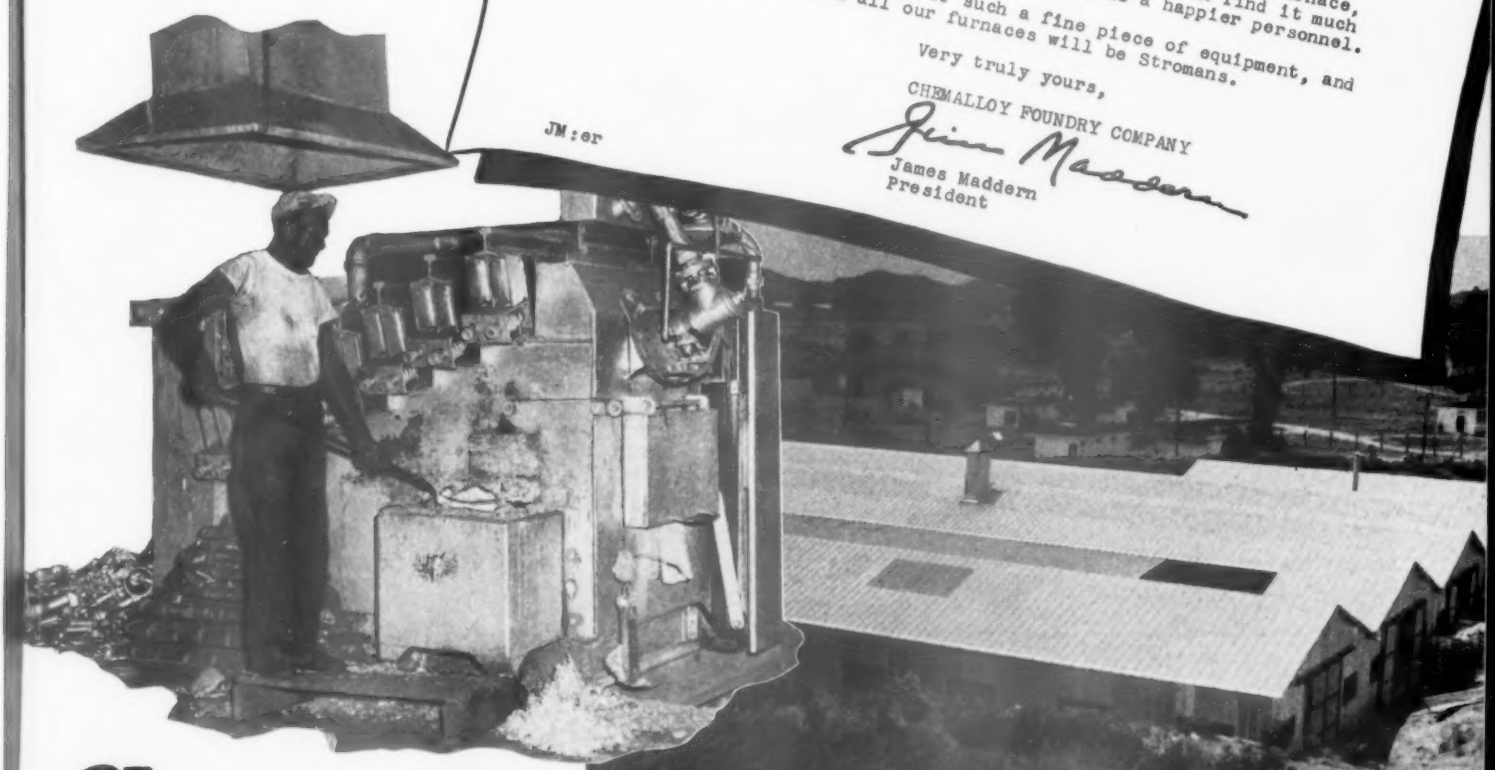
Very truly yours,

CHEMALLOY FOUNDRY COMPANY

Jim Maddern

James Maddern
President

JM:er



STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

LOOSE BARS ON THE JOB IN A HINES FLASK . . .

THE HINES

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LOOSE BARS?

sure you can work 'em in all

HINES SLIP OR POP-OFF FLASKS

Ask Any of Our Sales Engineers for Details

FLASK CO.

CLEVELAND 11, OHIO

Longer Nozzle Life Every Time

IF YOU are looking for a way to increase nozzle life in your blast cleaning department—if you wish to do away with costly time-wasting while worn-out nozzles are replaced with new nozzles—if you are searching for means to improve blasting efficiency and increase production—there is one answer for all three problems: NORBIDE Nozzles. Made of Norton Boron Carbide—the hardest man-made material—NORBIDE Nozzles will outwear conventional types fifty to one. This same wear-resistance enables these nozzles to retain peak efficiency for a long period with resultant production increases. Air consumption is reduced 10 to 20%. Stream contour and abrasive velocity are maintained.

For information as to size and price write for Bulletin No. 543

NORTON COMPANY
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NORTON NORBIDE PRODUCTS

TRUSCON
MARK OF MERIT
PRODUCTS

TRUSCON STEEL FOUNDRY FLASKS

Chase Father Time...

Truscon OM-1 One-Man Flask

Truscon CH-40 Crane Flask

Truscon TM-10 Two-Man Flask

with Truscon Steel Flask strength

The walls of every Truscon flask are built with great strength and rigidity to withstand severe strains. The ribs and flanges extend full depth around the entire flask without buckling or cutting away the metal. • The flanges and ribs of Truscon flasks are designed to help the molder. The flange on the filling side is turned out so it won't interfere with filling or shaking out. The flange on the bottom side or parting line is turned in, forming a sand strip to carry the sand. • Truscon flasks have available a range of handles and pin lugs to meet every particular need. *They are welded securely to withstand heavy strains.* • Every Truscon cope, drag and check is one integral piece of steel. Truscon flasks withstand the knocks and hard usage they are bound to get. • Write for catalog showing the wide range of Truscon Steel Flasks that can be manufactured.

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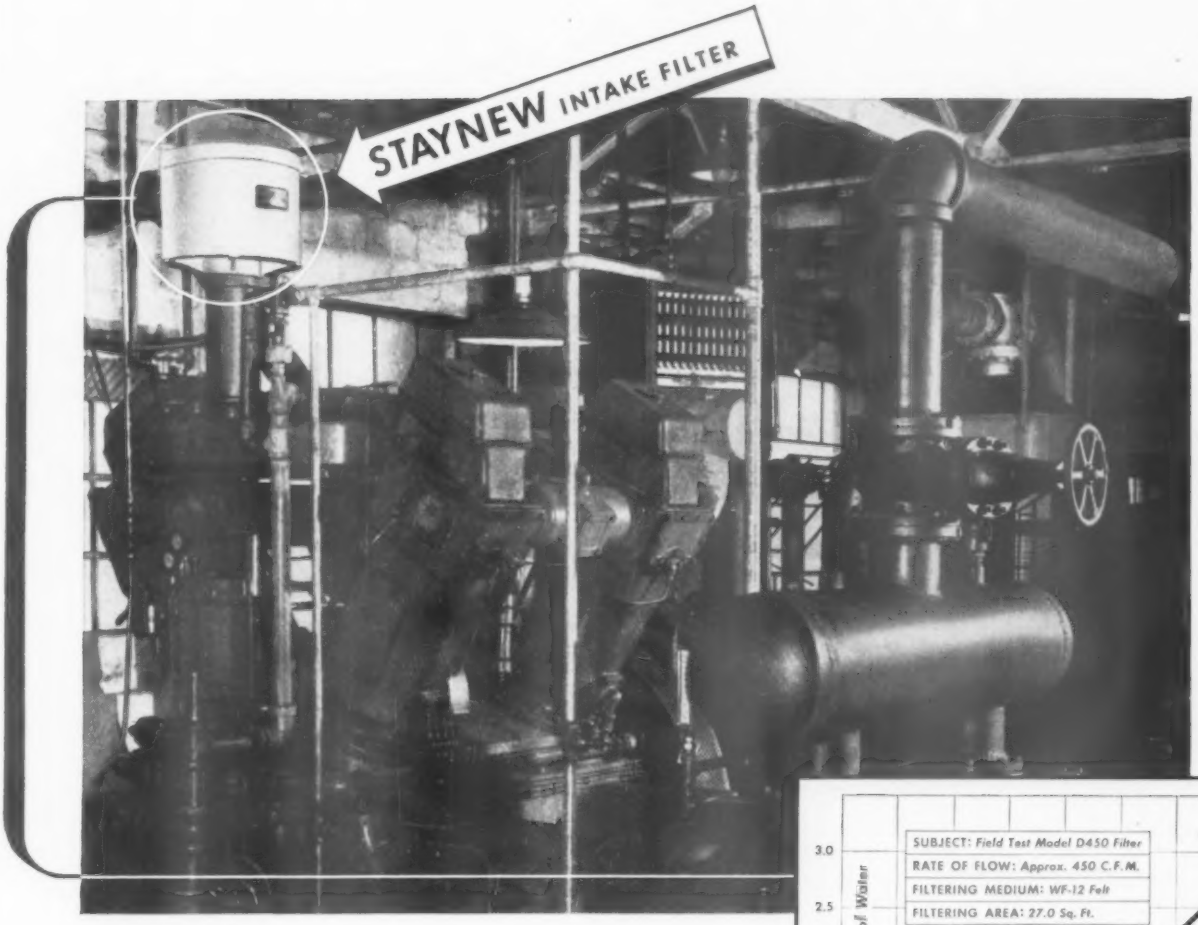


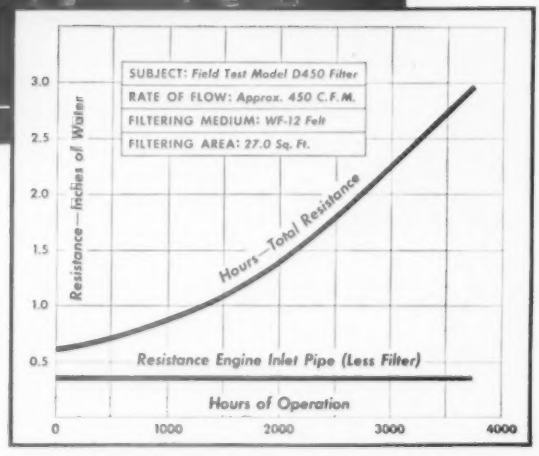
3761 HOURS CONTINUOUS OPERATION WITHOUT ATTENTION

Yet Filter Resistance Is Only 2.73 Inches of Water

This filter, installed on a Diesel-powered compressor, operates under unusually severe conditions. Intake air is heavily loaded with dust and oil; the dust due to the close proximity of a railroad siding where bulk lime, sand, and coal are handled—the oil to two additional Diesel-powered compressors operating in the same room.

Such a case history is not unusual. Reports are frequently received of Staynew Filters operating under less severe conditions for two or more years without attention—with the initially high efficiency rising as dust load increases.

Ease of cleaning as well as infrequency of cleaning is also an important feature, requiring only a few minutes with the specially designed Staynew Cleaning Nozzle.



More and more experienced operators of compressor and engine equipment specify Staynew Intake Filters—not only because of the minimum attention required, but also because these filters:

- ★ **Provide positive protection**
- ★ **Require no pre-coat or filter aid**
- ★ **Are unaffected by extremes of temperature**
- ★ **Permit use of oversize filters (air velocity not critical)**
- ★ **Are ideal for use with carbon ring compressors**

DOLLINGER PROTECTO MOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

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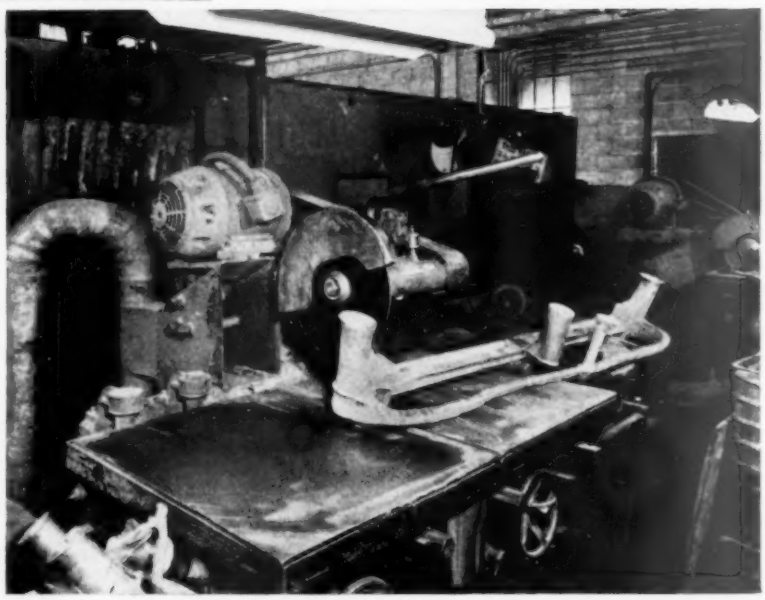
Reinforced Foundry Cut-Off Wheels

. . . in use at AMPCO METAL, INC., Milwaukee, cutting Ampco Grade 18 gates ranging from 3" x 1" to 7" x 4½"

MANHATTAN 20" x 3/16" Grade 463XX on FOX Swing Cut-Off Machine

MANHATTAN 16" x 1/8" Grade 463XX on TABOR Foundry Cut-Off Machine



Also available in 7"x⅛" and 9"x⅛" Moldiscs for use on portables for notching risers or trimming fins.

Come and see these wheels in operation at the Metal Show in Chicago, October 23-27. Booth 2130. Demonstrations with Tabor machine and also portables.

Bring in your cut-off and general grinding problems for discussion with our engineers.

ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION

PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings • Radiator Hose • Fan Belts • Mechanical Rubber Products • Rubber Covered Equipment • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

SHAKES OUT FIVE FLASKS IN ONE OPERATION!

PRODUCTION DOWNTIME IS MINIMIZED at the Continental Foundry and Machine company, East Chicago, Illinois, with this 8′ x 10′ twenty-five ton capacity *Foundromatic* shakeout. Continuous jobbing foundry operations handling castings up to 12 tons require the dependability of Allis-Chalmers shakeouts.

The load on the *Foundromatic* two-bearing shakeout is not limited by the shaft diameter or the size of the bearings. Entire load, plus the shakeout weight, is carried on support springs . . . giving long bearing life . . . preventing shaft failure.

Over 90% of the shakeout is isolated from the foundation by the support springs. Long spring life is obtained because bumper guides prevent over-stressing of the support springs.

Your requirements can be met by one of the nine sizes from 3′ x 5′ with capacity of one ton, to 8′ x 10′ with capacity of 25 tons. Multiple units can be supplied with capacities over 100 tons.

Call your nearby A-C Sales Office for information, or write for Bulletin 07B6365A. A-3014

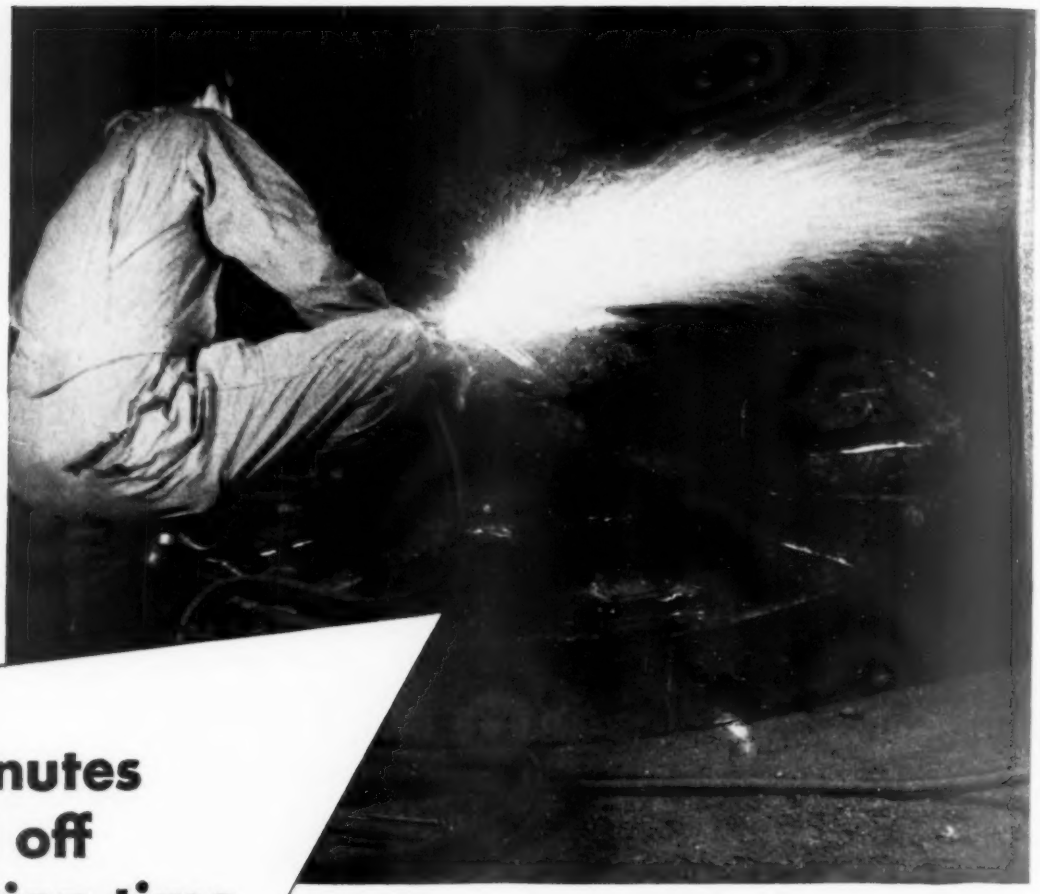
ALLIS-CHALMERS, 1032A SO. 70 ST.
MILWAUKEE, WIS.

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Foundry Equipment for Bigger Output-Better Working Conditions!



150 minutes slashed off production time

Formerly, the Pittsburgh Steel Foundry Co. removed sixty-pound riser pads from cast steel locomotive drive wheels by grinding . . . a slow, laborious procedure that took 3 hours per wheel.

Now, using Airco's modern flame scarfing technique, similar riser pads are removed in thirty minutes; thus 150 minutes of grinding time per wheel are eliminated, castings are ready for finish machining.

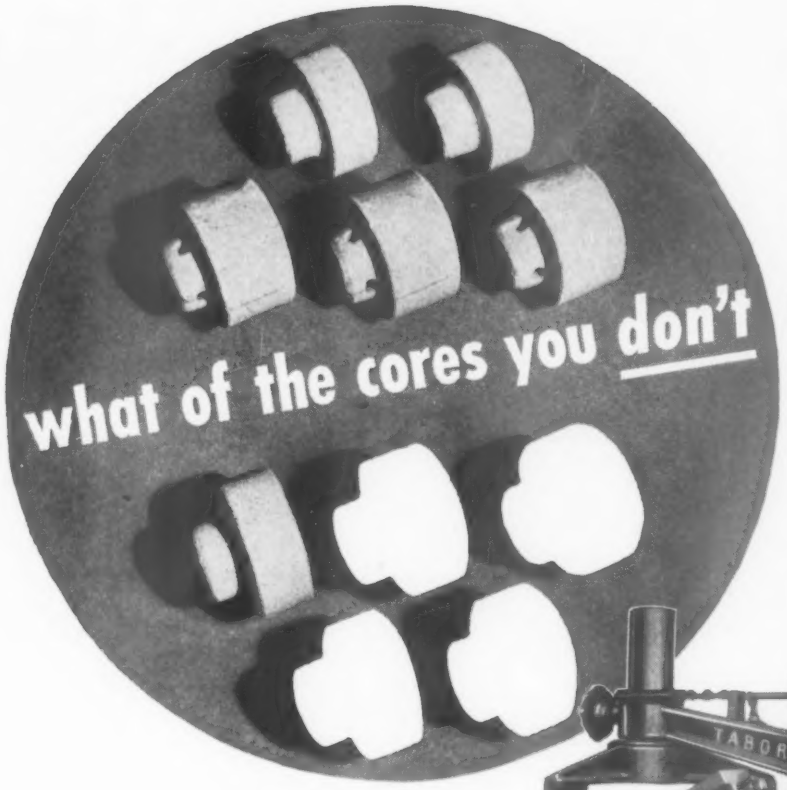
This is another example of the manner in which Airco modern oxyacetylene and electric arc methods are helping progressive foundry operators slash production time and costs.

For details of other applications of these two versatile production tools in foundry operations, write your nearest Airco office.

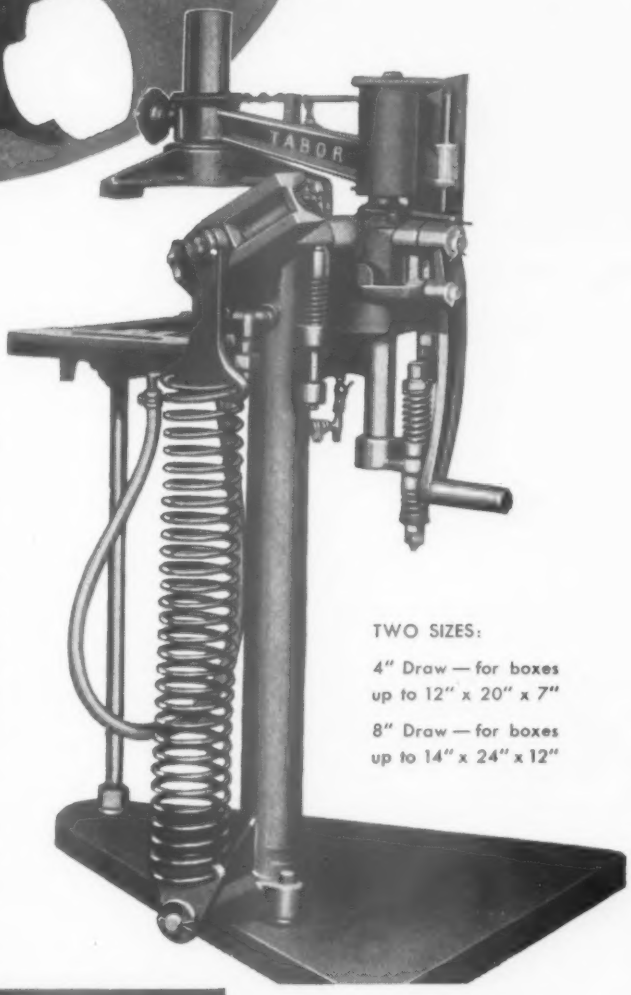
AIRCO **AIR REDUCTION**

Offices in All Principal Cities

HEADQUARTERS FOR OXYGEN, ACETYLENE AND OTHER GASES...CARBIDE...GAS WELDING AND CUTTING APPARATUS AND SUPPLIES...ARC WELDERS, ELECTRODES AND ACCESSORIES



...but what of the cores you don't make?



We mean the extra 40% production you lose

. . . those additional cores that a Tabor Rollover Core Machine could turn out for you in the same time.

The reason for "upped" production of small cores with the Tabor machine lies in its design—featuring simplicity, compactness, handy control.

There's no need for the operator to walk back and forth in order to clamp, level, roll over and unclamp the core box. Instead, he saves valuable time. From *one position*—and with *one control lever*—he completes each operation, from clamping the plate to conveniently swinging out the drawn core.

The ingenious features in the Rollover Core Machine are good examples of the plus-values built into all Tabor foundry equipment. That's what comes of 62 years' experience in designing and building foundry machines that more than meet foundrymen's needs.

TWO SIZES:

4" Draw — for boxes up to 12" x 20" x 7"

8" Draw — for boxes up to 14" x 24" x 12"

REPRESENTATIVES

Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; E. R. Frost Company, Inc., Minneapolis 14, Minn.; Harry H. Reich, Trussville, Ala.

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The **TABOR** *Manufacturing Co.*

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES

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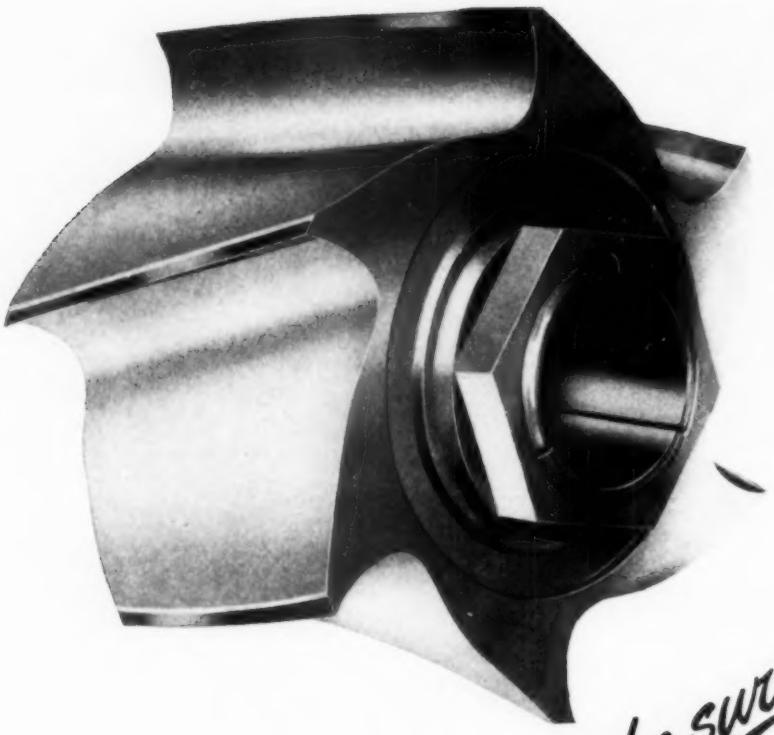
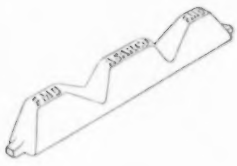


to be sure



REDCO TOOLS uses Federated TENZALOY

Helical carbide knives cast in an aluminum alloy body form the famous REDCO cutter heads used to machine wood, plastics, cast iron, and non-ferrous metals.

To be sure that the cutter body will withstand the stresses imposed upon it as the carbide knives bite through these materials, Redco Tools, Division of Red Lion Cabinet Co., Red Lion, Pa., uses Federated TENZALOY exclusively.

The high yield strength of TENZALOY . . . so important in this application . . . is obtained without the internal stresses normally found in high-strength, heat-treated castings because quenching is not required. Ductility, machinability and corrosion resistance are all excellent.

For literature on TENZALOY . . . with complete mechanical and physical properties . . . write Federated today.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N. Y.

Bulletin on SUPER REFRACTORIES

by CARBORUNDUM
TRADE MARK

NO. 10 OCTOBER, 1950

How Can Super Refractories Justify Their Higher Initial Cost?

In adjudging the value of a super refractory for a particular job, price should not be the sole determining factor. *Their overall usefulness and the savings they can effect should be the measure of their worth.* Refractory cost per unit handled is a good yardstick.

With their exceptional resistance to furnace atmospheres, thermal shock, slags, cracking, mechanical wear and high temperatures, super refractories by CARBORUNDUM give exceptionally long service. They also extend the life of adjacent refractories, eliminate frequent furnace outages, increase production, and decrease replacements and labor costs.

Another unique property of certain super refractories that often justifies higher initial cost, is high thermal conductivity. This provides quicker, more uniform heat delivery to the charge. Material quality is bettered, fuel consumption reduced, rejects cut, and output improved.

Still other benefits are to be gained in certain other types of installations. These applications, too, are usually limited to areas which cause repeated costly repairs and shut-downs.

Super refractories by CARBORUNDUM are most often applied where other refractories, for any of many reasons, are incapable of doing an adequate job.

Physical Properties of Super Refractories by CARBORUNDUM

Trade Mark

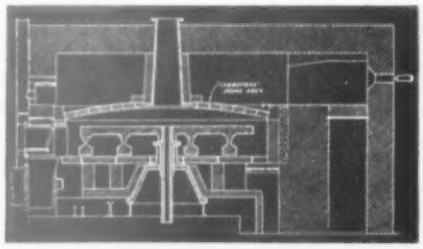
	CARBOFRAX Silicon Carbide	MULLFRAX Electric Furnace Mullite	MULLFRAX S Converted Kyanite	ALFRAX K Electrically Fused Alumina	ALFRAX B Electrically Fused Alumina	ALFRAX BI
Heat Conductivity at 2200° F. in BTU/hr. sq. ft. and °F./in. of thickness	109 BTU	16 BTU	9 BTU	24 BTU	12 BTU	7 BTU
REFRACTORINESS PCE CONE	37-40	38-39	37-38	37-39	39-40	38-39
SPALLING RESISTANCE	High	High	High	Good	Good	Good
ABRASION RESISTANCE	High	Medium	Medium	High	Medium	Low
THERMAL EXPANSION (25° — 1400° C.)	.0000044	.0000059	.0000069	.0000074	.0000086	.0000086
MODULUS OF RUPTURE @ 2460° F. PSI	800-3125	100-250	175-475	100-1050	100-225	50-100
WEIGHT 9 IN. STRAIGHT	9.25 lbs.	9 lbs.	8 lbs.	10.1 lbs.	7.25 lbs.	4.8 lbs.

Here's How Super Refractory Skids Justified their Cost

Since the metal skid rails in this furnace were replaced with CARBOFRAX silicon carbide rails, output has increased and maintenance dropped. This furnace is used for heating and reforming splice bars at about 2300° F. The 2½" round, low carbon steel skids required complete replacement every six weeks. Two full working days were lost — shutdowns were costly. And even between replacements, the metal skids warped badly and required straightening.

Now, however, long uninterrupted production has been achieved. The CARBOFRAX skids have been in operation for *over 2 years* — and have required *no attention.* And as much as 35.4 tons of bars have been pushed through the furnace in seven hours.

The same unique properties of these CARBOFRAX skids have also made possible similar improvements in other reheating furnaces.



Super Refractory Doubles Furnace Output

When the fireclay dome in this Mannhiem type muriatic acid furnace was replaced by a CARBOFRAX silicon carbide arch *output was doubled.* What's more, this changeover cut the fuel input ratio by 50%.

In terms of initial furnace investment, this means that two furnaces equipped with CARBOFRAX arches *will out-produce four identical furnaces*

"Carborundum," "Carbofrax," "Mullfrax," "Silfrax," "Alfrax" are registered trademarks which indicate manufacture by The Carborundum Company

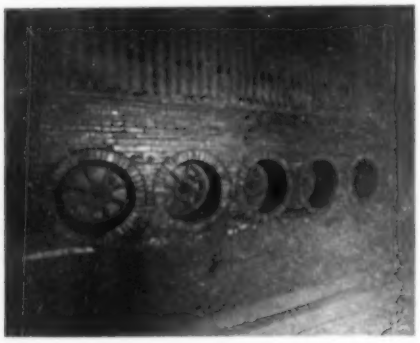
Address all correspondence to: Dept. A-100, THE CARBORUNDUM COMPANY, Refractories Division, Perth Amboy, New Jersey

Continued on other side →

← Continued from other side

having fireclay arches. The savings in maintenance, labor and fuel costs are obvious.

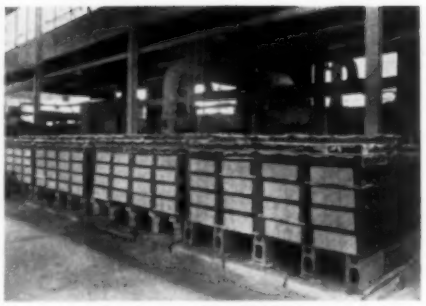
One of the unique properties of CARBOFRAX shapes making this possible is a thermal conductivity 11 to 12 times that of fireclay (nearly equivalent to that of alloy steel at high temperatures). Another characteristic is the high hot strength of CARBOFRAX brick and shapes. At 1350° C, for example, the modulus of rupture is well over 3000 psi. Furthermore, shrinkage is practically non-existant. Measured cold after 1¾ hours at 1500° C, actual tests show zero linear contraction. As a result, serious distortion — even with spans of 20 feet or more — is avoided, and dome life is much improved.



Maintenance Savings Pay for These Brick

Pictured here is the front wall of a 150,000 lb. per hr. pulverized coal fired boiler. The photo was taken three years after the CARBOFRAX silicon carbide burner rings had been installed and following the annual pointing-up and cement wash coating of the inner faces. None of the brick had been reset. The CARBOFRAX rings have resisted the abrasive action of the fuel as well as the spalling condition promoted by the secondary air around the burners. Considerable additional service is expected from these brick.

CARBOFRAX brick have been used to face the front wall above and around these burner rings. Previously, slag fingers built up on this wall, extended down over the burners and distorted the flame. As a result, it was necessary to shut down each month to bar off the slag. Now, however, slag fingers do not build up on the hard, dense face of the CARBOFRAX wall and these monthly shutdowns have been eliminated. Consequently, the operator considers that labor and maintenance savings alone have paid for the brick.



Tile Manufacturer Increases Car Capacity 40%

By changing from clay saggers to open settings with CARBOFRAX silicon carbide setter tile, I-beam posts and saggers, this floor and wall tile manufacturer increased car capacity approximately 40% — with no change of kiln schedule.

In this operation, bisque wall tile are fired on CARBOFRAX tile. The setter slabs and ware are carried on 3-point support of I-beam posts. Floor tile are burned in CARBOFRAX saggers on top of the car. And after each trip, the cars are torn down and rebuilt.

The high mechanical strength, freedom from warping and blistering, and resistance to thermal shock of CARBOFRAX kiln furniture, have resulted in important savings to this company. Super refractories by CARBORUNDUM and engineered car settings have made the difference — as has been the case in many other ceramic plants.

Super Refractory Proves Profitable for Incinerator Operation

This photo shows part of the interior of an incinerator operated by a large industrial city. The furnace is approximately 8′ x 24′, and operates at 1700° — 2400° F. CARBOFRAX silicon carbide brick are used from the grate level to the tubes, and CARBOFRAX shapes are used around the four stoking door openings.

Note the excellent condition of the CARBOFRAX brick after more than three years service. Note, also, the absence of fly ash and other accumulations despite the fact that these walls had not been cleaned for 1½ years. Compare this with the deposit above the tubes where other refractories are used. The difference is particularly pleasing to the operator because, with fireclay, brickwork was always pulled away in the process of removing these accumulations. Moreover, CARBOFRAX brick are very resistant to erosion and cutting back — an added problem when other types of linings were used.

Before the installation of CARBOFRAX brick, this incinerator needed complete rebuilding every two years, plus patching and replacements during this period. Now, however, periodic repairs have been eliminated, and even after three years CARBOFRAX brick still are satisfactory for considerably more service.

The high refractoriness, cracking and spalling resistance, and excellent hot strength of CARBOFRAX brick have been used advantageously in this job. Other product properties of special value around the stoking doors are resistance to thermal shock and mechanical abrasion.

This is another example of how the benefits of super refractories by CARBORUNDUM more than justify their original cost.

To obtain facts and figures on installations in specific fields merely select from this list of bulletins. Copies will be sent you at once. No obligation, of course.

Super Refractories by CARBORUNDUM (general catalog)

Super Refractories for the Ceramic Industry

Super Refractories for the Process Industry

Super Refractories for Boiler Furnaces

Super Refractories for Heat Treatment Furnaces

Super Refractories for Gas Generators

The Frax Line of Cements

CARBOFRAX Refractory Skid Rails

Porous Media for Filtration & Diffusion

Dept. No. A-100

THE CARBORUNDUM COMPANY

Refractories Division

PERTH AMBOY, NEW JERSEY

CUT FURNACE TIME and FUEL BILLS with "PSC" LIGHT-WALL RADIANT TUBES

As a leading supplier of tubing to builders and users of radiant tube furnaces, Pressed Steel Company's assemblies dependably furnish such general features as compactness, removability, uniform heating over tube length, etc. The distinctive feature of PSC radiant furnace tubes is their light-wall construction. Installation records repeatedly show that this feature effects marked economies in fuel and furnace time. Our "light-wall" construction is based on a quarter century's experience in precision fabrication of sheet alloys.

TUBE ASSEMBLIES FOR EVERY PURPOSE

Tubes for all types of radiant furnaces. We specialize in secondary burner tubes for highest temperatures. Let us show you how PSC light-wall tubes cut maintenance and furnace time.

PSC EQUIPMENT IS "ALLOY RIGHT"

Light-Weight **Heat-Treating Equipment for Every Purpose**

Carburizing and Annealing Boxes	Tumbling Barrels • Tanks
Baskets • Trays • Fixtures	Cyanide and Lead Pots
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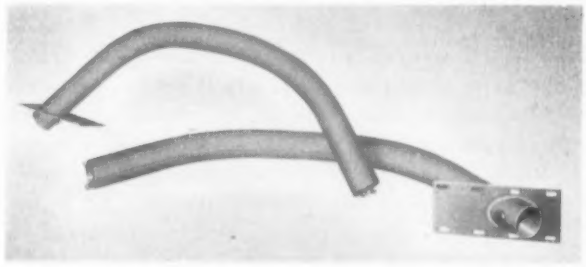
Annealing Covers and Tubes	Radiant Furnace Tubes and Parts
Pickling Equipment	Heat, Corrosion Resistant Tubing



We precision assemble the most complicated designs of radiant furnace tubes. Send blue prints or write as to your needs. We fabricate heat-treat units from the complete list of alloys. You can choose the metal that is "alloy-right" for your needs.

THE PRESSED STEEL COMPANY
of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

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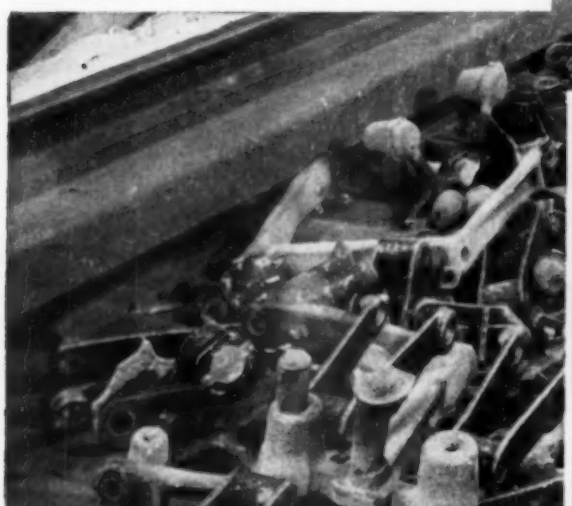
MECHANIZE your PRODUCTION

Increase Volume with JEFFREY EQUIPMENT

We are not magicians! Far from it . . . but we can help you meet the challenge: "Step up volume—scale down costs."

Sound engineering, modern manufacturing methods, and complete facilities for making tests and laboratory experiments give Jeffrey an enviable place in the material handling field.

You can put your problem of mechanization for profit squarely into the hands of Jeffrey Engineers. They have had years of experience . . . have installed some of the largest handling jobs in the country . . . have a complete line of modern and improved machinery from which to choose. We will work with you . . . and for YOU.



A Jeffrey-Traylor Electric Vibrating Feeder (with absolute control over tonnage handled) feeds parts to a Jeffrey Steel Apron Conveyor on which sorting and inspection operations may take place as unit moves along—thence to shipping or storage.

For loose, bulk materials, Jeffrey Belt Conveyors provide a constant, uninterrupted flow—and economically. Equipped with Timken tapered roller bearings, Jeffrey Belt Idlers have reserve strength and durability—will provide many years of satisfactory, efficient, trouble-free service. Catalog No. 785 gives capacities, sizes, ratings, speeds, etc.

THE JEFFREY MANUFACTURING COMPANY Established 1877

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Complete Line of Material Handling, Processing and Mining Equipment

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How Manganese Briquets Control Sulphur . . . Produce Cleaner, Sounder Iron Castings

The use of manganese briquets in the cupola charge provides a convenient and accurate method of controlling this important element in cast iron. Accurate control of the manganese level is essential for the consistent production of high-quality iron. While manganese will be introduced in varying amounts by the pig iron and scrap, a supplementary source—such as manganese briquets—is usually essential if accurate analysis control is to be maintained.

Manganese has two important functions in cast iron:

1. It acts as a sulphur-neutralizing element when used in small amounts — up to roughly six times the sulphur content.
2. It acts as an alloying element, imparting density and strength when present in amounts greater than necessary to perform its desulphurizing function.

Neutralizes Sulphur

Cast iron tends to run considerably higher in sulphur than was the case a decade ago because there has been an increase in the sulphur content of both scrap and foundry coke in recent years. Unless sufficient manganese is provided in the cupola mixture, this higher sulphur content will tend to produce a hard, brittle metal with deep chilling properties and poor fluidity. Castings of such metal are difficult to machine and may be the cause of many foundry troubles, including strain cracking, chilled corners and edges, and misrun castings.

Since manganese has a high affinity for sulphur, it forms manganese-sulphide inclusions when present in sufficient amounts. These inclusions are relatively harmless to the metal, and the detrimental effects of the sulphur content are thus largely eliminated. It is good practice to maintain a manganese-sulphur ratio of approximately 6:1 to insure proper neutralization of the sulphur content.

A certain proportion of the manganese-sulphide that is formed will float to the surface of the molten iron and be absorbed by the cupola slag. In this way, manganese actually eliminates a portion of the sulphur introduced by cupola melting. Thus, relatively high manganese irons will invariably run lower in sulphur than will metal melted from similar raw materials but of lower manganese content.

Sounder Castings

The cleansing effect of manganese is a decided help in producing a high-quality foundry product with a minimum amount of trouble from porosity, shrinks, and blows. Manganese helps to neutralize gassy metal that may result from temporarily unbalanced cupola conditions or poor-quality melting materials. It improves the fluidity of iron that may be a little on the cold side or high in sulphur. Manganese does a general cleansing job that is helpful in avoiding slag inclusions, which have a detrimental effect on machinability.

Alloy Effects

When manganese is used in amounts greater than that necessary to neutralize sulphur, it acts as a desirable carbide-stabilizing alloy in cast iron. Depending on the amount added and other elements present, manganese tends to refine pearlite and, at higher levels, to form martensite. Increasing the normal percentage of manganese in cast iron to 1 per cent or above will often change a normally ferritic-pearlite matrix to the stronger all-pearlitic structure.

Two Types of Briquets

ELECTROMET produces two types of manganese briquets — EM silicomanganese briquets and EM ferromanganese briquets. The silicomanganese type is square in shape and contains exactly 2 lb. of manganese and about ½ lb. of silicon. Ferromanganese briquets, which are oblong in shape, also contain exactly 2 lb. of manganese, but do not contain silicon.

The recovery of manganese from EM manganese briquets normally runs about 85 per cent, because the briquets are made with a binder that prevents oxidation until the alloy unites with the iron in the melting zone of the cupola.

A typical mixture for high-strength iron is given in the accompanying table. For further information—

The terms "EM" and "Electromet" are registered trade-marks of Union Carbide and Carbon Corporation.

Typical Cupola Charge for Producing High-Strength Iron With EM Briquets

Base Charge			Alloys in Charge Material			
			Silicon		Manganese	
%	Lb.	Material Charged	%	Lb.	%	Lb.
15.0	150	Pig Iron	2.30	3.45	0.70	1.05
40.0	400	Steel Scrap	0.10	0.40	0.45	1.80
35.0	350	Return Scrap	1.90	6.65	1.00	3.50
10.0	100	Purchase Scrap	2.00	2.00	0.45	0.45
100.0%	1,000 lb.	Total Base Charge		12.50		6.80
Briquets Required		7½ Small Silicon		7.50		—
		2½ Silicomanganese		1.25		5.00
		Total Alloys Charged		21.25 lb. Si. or 2.12% Si.		11.80 lb. Mn. or 1.18% Mn.
		Melting Recovery Factor		x .90		x .85
		Final Analysis of Iron		1.90% Si.		1.00% Mn.

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Refractory Cement Selection Made Easy

for ferrous melting furnaces

Type of furnace	metals melted	use of cement	Norton number	cement recommended description	maturing temp.	max. temp.	how applied
indirect arc	alloy iron and malleable iron	lining	RA1144	coarse grain Alundum* cement	2100°F	2950°F	rammed
		patching	RA1160		1850°F		rammed
		troweling around electrodes	RA162	fine grain Alundum cement	1850°F	2950°F	troweled
direct arc	alloy steel and malleable iron	lining roof and around electrodes	RA1144	coarse grain Alundum cement	2100°F	2950°F	rammed
		lining roof and around electrodes	RA1195	very coarse grain Alundum cement	2000°F	3100°F	rammed
		patching	RA1160		1850°F		rammed
high frequency induction	stainless steel and refractory alloys	lining	RM1169	very coarse grain Magnorite* cement	2100°F	3250°F	rammed (dry)
		patching large furnaces	RM868	medium grain Magnorite cement	2200F°	2750°F	rammed
		patching small furnaces	RM1171	medium grain Magnorite cement	2000°F	2900°F	troweled or rammed

for non-ferrous metal-melting furnaces

low frequency induction	refractory alloys, cupronickel, nickel silver, high copper alloys Al, Te, Si bronzes	lining	RM1140	coarse grain Magnorite cement	2300°F	3250°F	rammed
	nickel silver	lining	RA1195	very coarse grain Alundum cement	2000°F.	3100°F	rammed
	brasses not more than 90% copper or less than 10% zinc	lining	RA1144	coarse grain Alundum cement	2100°F	2950°F	rammed
indirect arc	nickel and high nickel alloys	lining	RA1144	coarse grain Alundum cement	2100°F	2950°F	rammed
		patching	RA1160		1850°F		
crucible melting furnaces■	brasses and bronzes	lining and patching	RC1188	coarse grain Crystolon* cement	2000°F	3050°F	rammed
		lining and patching	RC1133	coarse grain Crystolon cement	2100°F	2950°F	rammed
		lining and patching	RC1204	coarse grain Crystolon cement	2000°F	2900°F	rammed
reverberatory furnaces▼	brasses and bronzes	lining and patching	RC1188	coarse grain Crystolon cement	2000°F	3050°F	rammed
		lining and patching	RC1133	coarse grain Crystolon cement	2100°F	2950°F	rammed
		lining and patching	RC1204	coarse grain Crystolon cement	2000°F	2900°F	rammed

■ Cement not in contact with metal, used in combustion chamber.
▼ Cement in contact with metal. * Trade-marks Reg. U. S. Pat. Off. and Foreign Countries.

This Chart is a synthesis of several charts from a new 16-page bulletin just prepared by Norton refractory engineers, after exhaustive laboratory and field tests.

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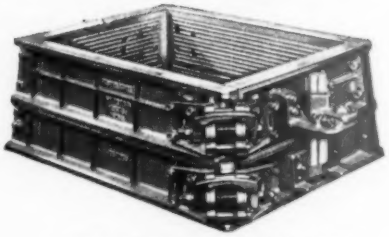
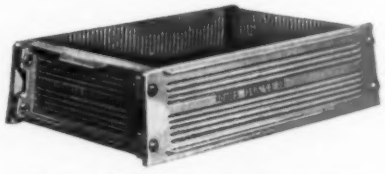


Adams Aluminum Easy-Off Flask



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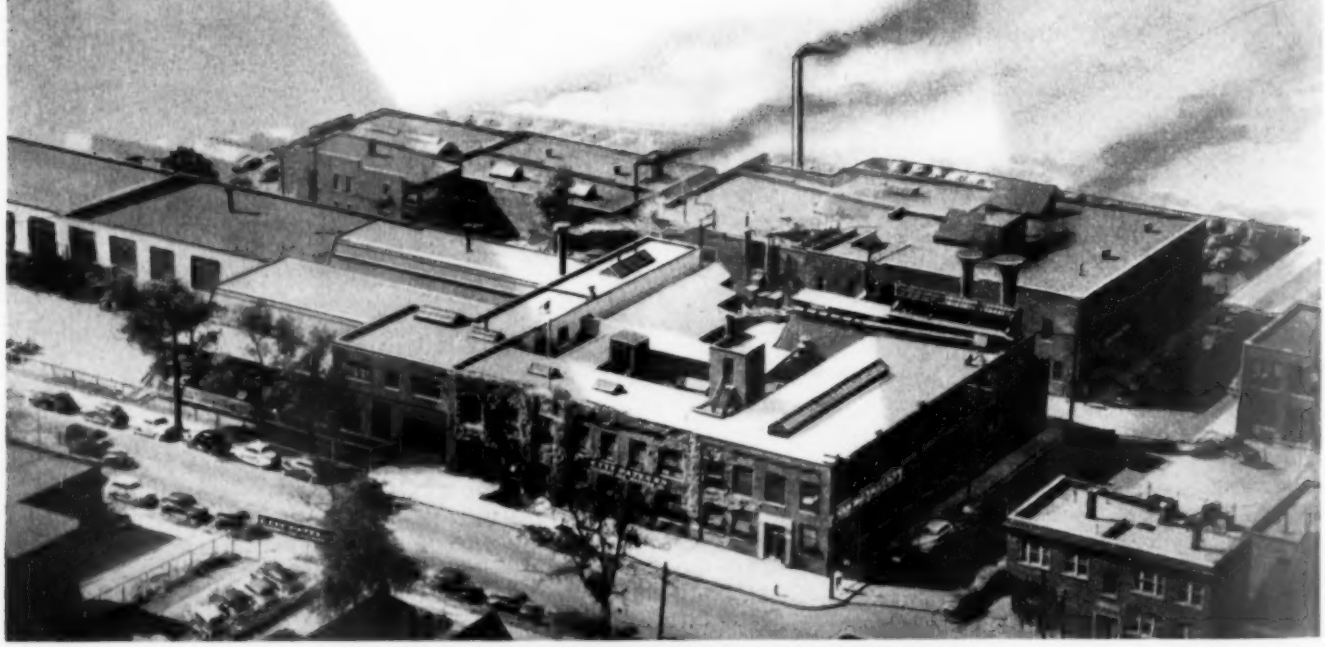

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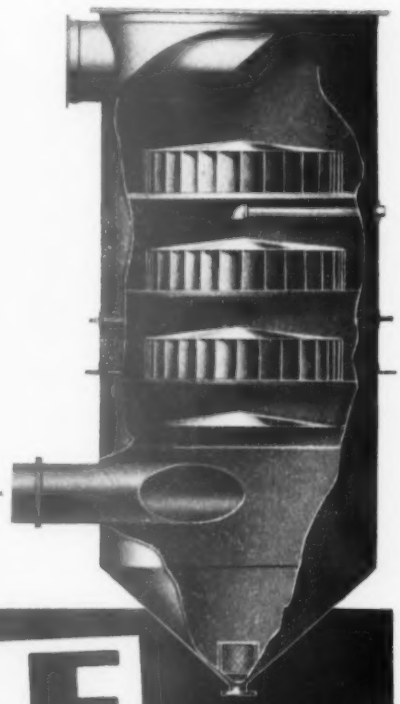

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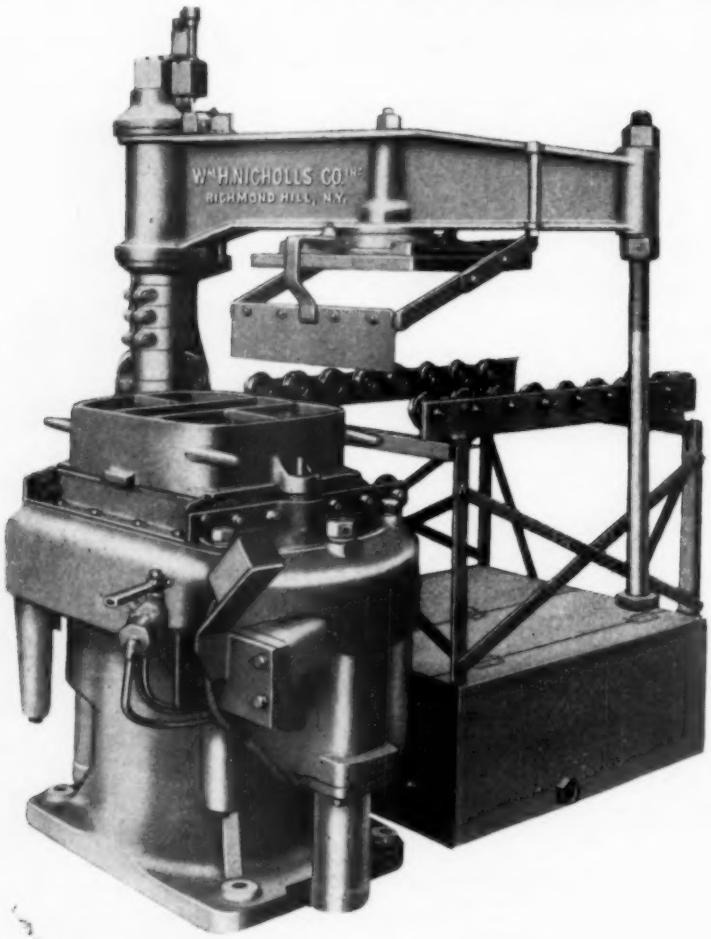

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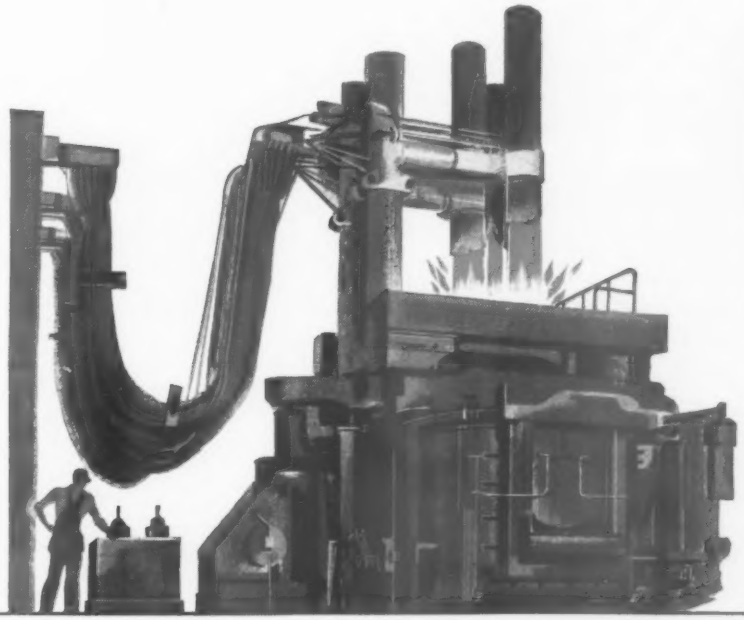

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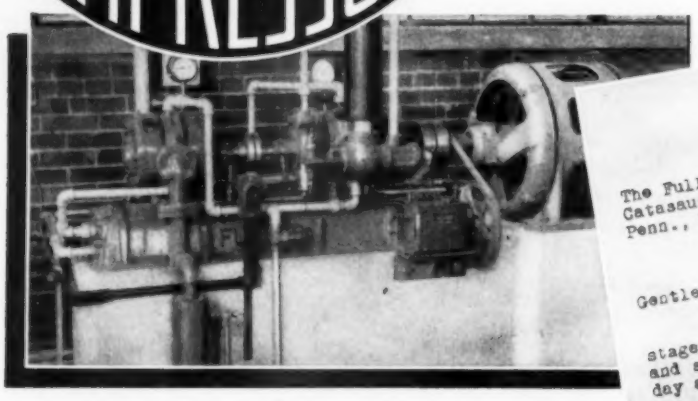

February 23, 1942.

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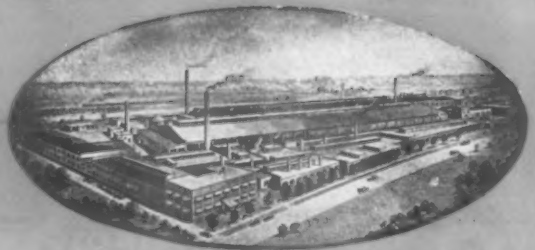

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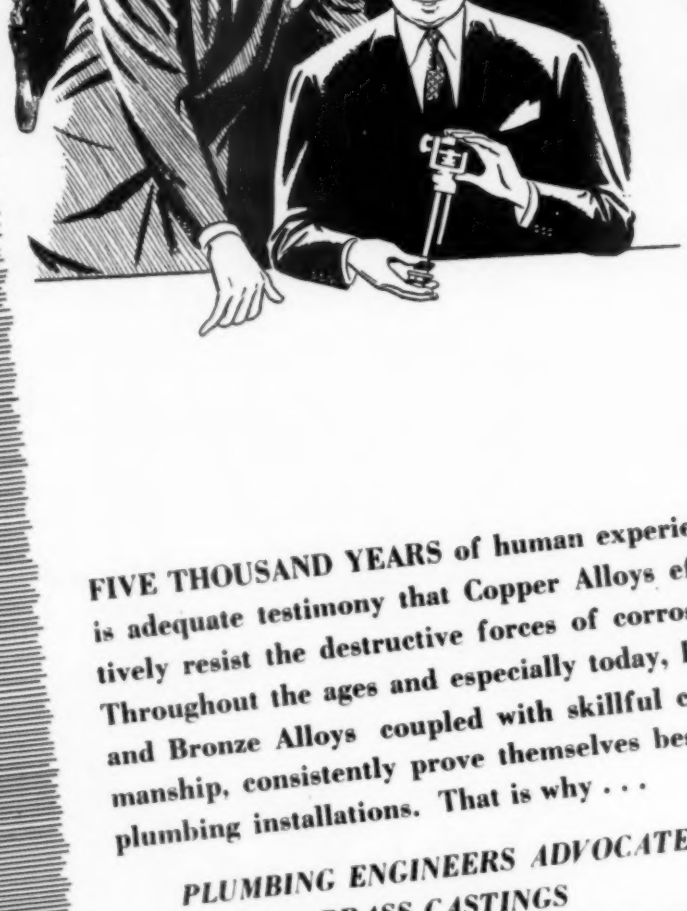

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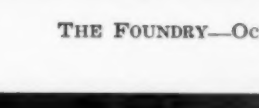

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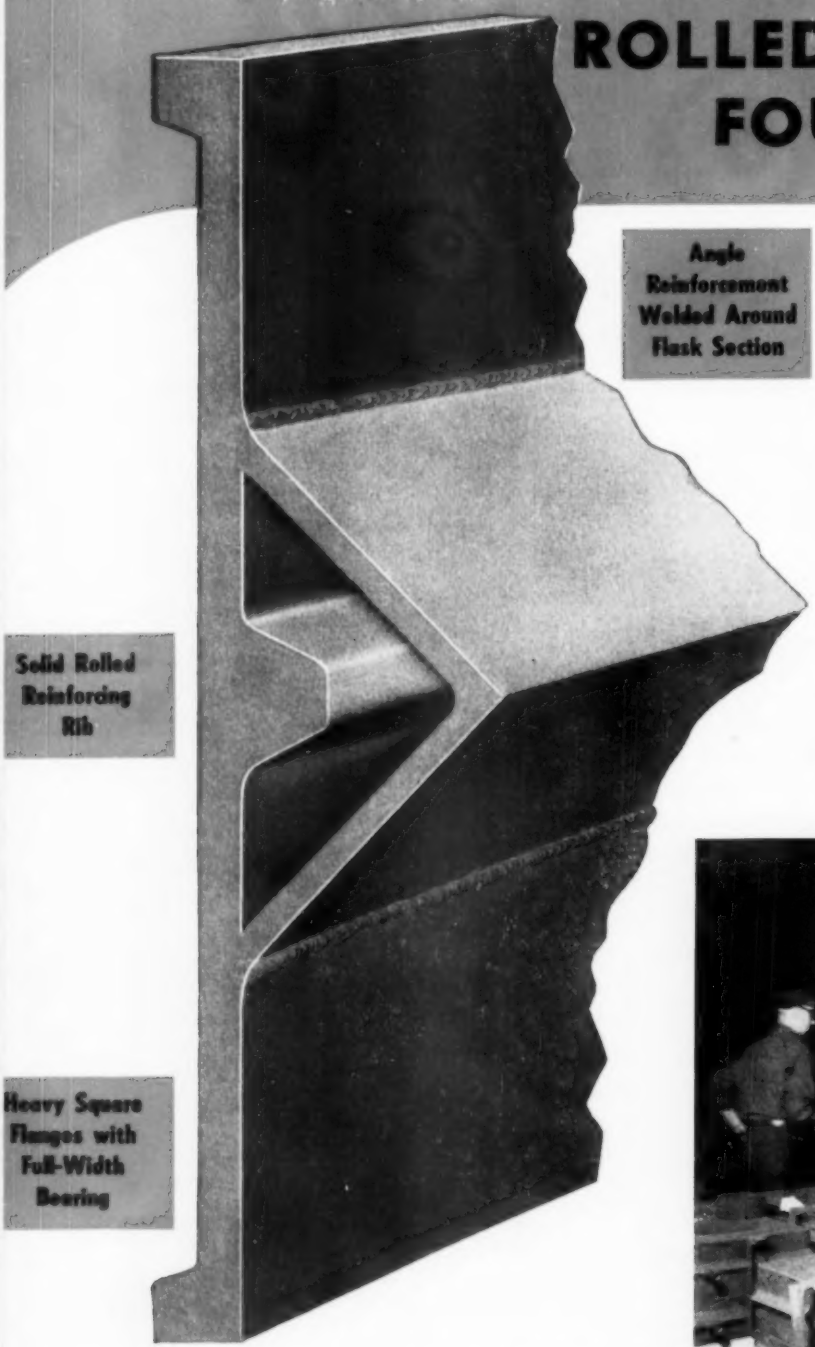
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Flanges permit accurate machine finish and cannot curl under jolt action. They contain sufficient stock to allow re-machining several times.

Foundry Industry Needs More Pig Iron Capacity

FERROUS foundries in most districts are encountering shortages of pig iron and coke, even before the defense program gets well under way. The pig iron situation was summed up in the following Pittsburgh market report published in a recent issue of the magazine Steel:

There is growing evidence that scarcity of pig iron will become more acute over coming months. Integrated mills are utilizing a larger portion of available capacity for internal use. This situation, coupled with widespread increase in activity among both captive and jobbing foundries, has resulted in a shortage of pig iron that is more acute than during the war years. Some trade authorities contend the only answer lies in a formal system of priorities which would eliminate shipments of iron for production of nonessential uses. A number of foundry interests have made substantial commitments for foreign iron to help ease the situation. Bulk of foundries have been forced to increase sharply proportion of cast scrap in melting operations. Sellers are rationing iron on a month-to-month basis.

Shortages of foundry iron began in 1941 when production for war really got under way, and continued throughout the conflict. The certification policy of the early postwar period, which provided an unlimited supply of pig iron for veterans' housing projects, hampered foundries not making certified work in operating on a five-day basis. By the time that allocation program expired, demand for castings had increased to the point where pig iron shortages continued to plague foundrymen. With the exception of four to six months early this year, the need for more iron has persisted up to the present.

Responsibility for difficulties in securing sufficient pig iron for the industry's needs rests principally with foundry operators. Prior to World War I, a sizable number of merchant furnaces served the foundry industry. After the war, some integrated steel companies found their blast furnace facilities could produce more iron than needed in the manufacture of rolled steel. To operate these furnaces economically, the steel companies invaded the foundry market by offering their excess iron at prices somewhat under those required by the merchant furnaces. Always price conscious, due perhaps to pressures constantly exerted by casting customers, foundrymen deserted the old sources of supply. As a result, merchant furnaces gradually went out of business.

While some integrated companies have done an excellent job in providing iron for foundries during the past decade, there remains a temptation in times of peak demand to utilize as much iron as possible in the manufacture of steel products.

Since hope of returning to normal production levels appears to have vanished, and emergency production with growing shortages probably will be with us for a long time to come, consideration should be given to increasing the quantity of iron available to ferrous foundries. Efforts should be directed toward the building of new blast furnace capacity and additional coke producing facilities for the production of foundry iron.

If steps are to be taken to remedy the situation, the initiative must come from the foundry industry.

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Pressure Castings—

Nickel-Alloyed Red Brass

In this second of a series of articles on nickel-alloyed bronzes, the author discusses different types of pressure castings. Mechanical properties and suggested foundry practice for them are given

THE base alloy for pressure castings has traditionally been Ounce Metal or 85-5-5-5. The characteristics of this composition have made it, perhaps, the largest tonnage product of the bronze foundry. Its inherently good corrosion resistance and fairly good strength have been badly beaten up in the drive for lower cost, so that some modifications contain lead contents up to 10 per cent and zinc contents up to 20 per cent.

The specification level of 30,000 psi tensile and 20 per cent elongation for Ounce Metal, may be debased in the 10 per cent lead and 20 per cent zinc range, to the 20,000 psi tensile and 15 per cent elongation level where these bronzes have difficulty in justifying their existence in competition from nonmetallic materials of good corrosion resistance but with low strength or low ductility.

A solution that eliminates the depreciation in mechanical properties of the 85-5-5-5 composition, may, be achieved by setting a range of 4 to 6 per cent lead and 4 to 6 per cent zinc for the specification and, in lieu of an equal amount of tin, permit a 6 per cent maximum tin plus nickel content in which the tin is not less than 2.5 per cent.

Proposed Specification for 2.5 Per Cent Nickel in Red Brass

Copper	*Nickel*	*Tin*	*Lead*	*Zinc*
Bal. (Approx. 85%)	2.5-3.5	2.5 min.	4-6	4-6

This modification, with approximately 2.5 per cent tin and 2.5 per cent nickel, maintains or excels Ounce Metal mechanical properties and corrosion resistance, while preserving the traditionally good foundry characteristics. This composition should not be confused with the red brasses containing less than 2.5 per cent tin mentioned later in this text.

Nickel additions of 1 to 3.5 per cent to the pressure bronze castings in Table I add measurably to the density, tensile strength, yield strength and toughness of these compositions especially for tin contents of 3 per cent or more.

In addition to the grain-refining and densening effect of nickel in the pressure casting metal, its function is to bolster the strength of the compositions in the low tin range, as in Nos. 12, 13 and 14 of Table I, and raise the strength of the standard 5 per cent tin grade to superior heights with 5 per cent of nickel, as in No. 11, or to superlative heights as in No. 11 H. T.

The opportunity for up-grading Ounce Metal (85-5-5-5) from both a foundry as well as engineering standpoint, exists in the presence of its 5 per cent tin content. When it is alloyed with 5 per cent of nickel, it acquires the ingredients necessary (5 per cent tin—5 per cent nickel) for precipitation hardening. This 5 per cent nickel alloyed composition as cast possesses substantially higher mechanical properties and corrosion resistance. It is now in condition to benefit from heat treatment by means of which its mechanical properties may be extended to encompass a wider range of engineering applications. It becomes eligible to join the Ni-Vee family of alloys and it is represented in Table I under No. 11 as a

Fig. 1—Check valve body cast in Ni-Vee type bronze, containing 7 per cent tin and 9 per cent nickel

Fig. 2—Dental machine part illustrating the soundness produced in intricate bronze castings by alloying with nickel. Copper 85 per cent, tin 4 per cent, lead 5 per cent, zinc 5 per cent, nickel 1 per cent (Courtesy of Ritter Co. Inc., Rochester, N. Y.)

Ni-Vee L5Z5.

The lead-alloyed bronzes of the 5 per cent nickel—5 per cent tin type are substantially strengthened and hardened by a low temperature anneal at 550°F for 5 to 10 hours. Castings such as pumps, valves, fittings, flanges, fixtures, meters, hydraulic castings, plumbing goods, and the numerous fluid-pressure load-carrying castings that are made in the foundry, can be improved by these relatively simple alloying or alloying-plus-heat-treating processes. Pressure castings of the leaded bronze type can thus be made available at comparatively high strength in the as-cast condition, or at still greater strength if subjected to a 550°F aging heat treatment. By the simple addition of 5 per cent nickel to Ounce Metal, a Ni-Vee type composition is created which can be made to possess a strength exceeding that of Gun Metal ("G" Bronze) or gear bronze, while maintaining the inherently excellent properties of Ounce Metal as "pressure casting metal."

Plumbing goods and miscellaneous pressure castings suitable for service in which corrosion resistance and mechanical properties of a high order are not needed, are commonly made in compositions of the type represented in Nos. 15, 16 and 17 of Table I. These compositions, classed as the semi-red brass type, contain more than the 5 per cent lead and 5 per cent zinc allowed in Ounce Metal and are correspondingly weakened. No. 15 is commonly called "81" metal for its copper content. Nickel additions of 3 per cent and 5 per cent to these low-tin compositions enable them to acquire the strength lost by balancing the excess above 5 per cent each of lead and zinc, with a compensating amount of nickel. Good mechanical properties and foundry characteristics are thus achieved in these compositions at low cost. Compositions Nos. 16 and 17 are of this type.

Composition No. 18 may be similarly improved with nickel additions. It is usually used for unstressed applications where mechanical properties are unimportant. Pressure castings for which these compositions are used, seem to be too numerous to itemize. Pumps, valves, cocks, fittings, compressors, condenser parts, meters and the many specialty fixtures that act as control devices or elements of hydraulic systems, boiler plants, gas works, refrigerators, plumbing goods, etc. are a few.

In certain applications, the pressure bronzes are used as bearing metals; in such cases lead contents may be increased to achieve a greater population of

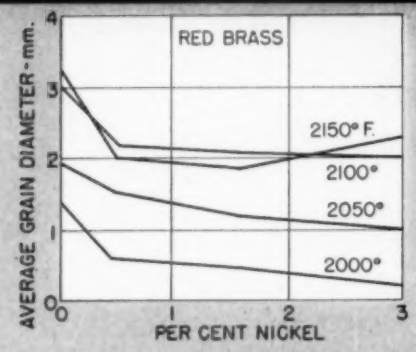

Fig. 3—Effect of nickel on grain size of red brass. Copper 85 per cent, tin 5 per cent, lead 5 per cent, zinc 5 per cent

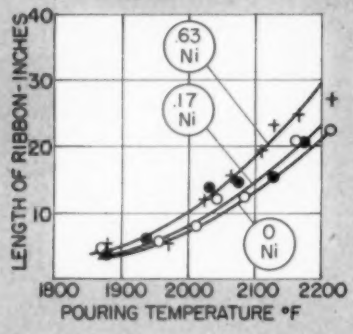

Fig. 4—Effect of nickel on fluidity of red brass

Fig. 5—Fluidity vs temperature—red, yellow brass

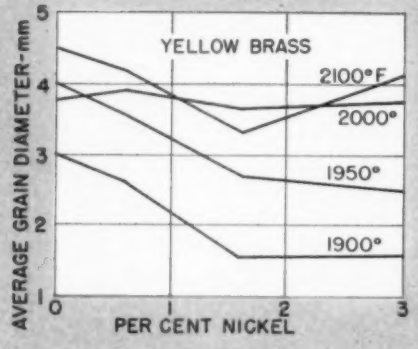

Fig. 6—Relationship of grain size to nickel content for yellow brass. Copper 70 per cent, tin 1.0 per cent, lead 2.0 per cent, zinc 27 per cent

lead particles with a correspondingly improved resistance to galling.

Piston rings and bushings in the joints and bearings of reciprocating or rotating assemblies are often made in the bronzes of Table I.

A large tonnage of pressure castings is made in compositions containing more than 10 per cent, and up to 20 per cent of lead plus zinc with less than 3 per cent tin. These compositions are commonly called semi-red brasses and are used for low pressure water and low temperature steam valves and fittings and for low-cost plumbing goods. Mechanical properties are unimportant and corrosion resistance is also of lesser importance than in the bronzes containing a total of less than 10 per cent of lead plus zinc. Nickel additions to these compositions usually do not have available sufficient tin upon which to act effectively to form the precipitation hardening theta phase to improve the strength properties. However, certain correlative properties such as density, grain refinement, lesser sensitivity to pouring temperatures and improved machinability are developed which indirectly contribute to the strength or pressure casting properties.

Nickel Improves Yellow Brasses

The yellow brasses with zinc contents in the 30 per cent range become less tough, harder, and more difficult to cast and to machine than their red brass cousins. In general, considerable corrosion resistance is sacrificed except for occasional special applications involving sulphidization in which zinc may be helpful. Tin contents are less than 1.5 per cent, and nickel additions up to similar amounts act upon the density, grain refinement and similar properties as in the case of semi-red brass.

Foundry Practice—Foundry practice for the pressure bronzes of less than 5 per cent zinc content, follows the accepted course of melting under a slightly oxidizing atmosphere (.2 to .8 per cent oxygen) and as is common for lead-alloyed bronzes, stirring and then pouring quietly at as low a temperature as consistent with the procurement of smoothly-run castings. Pouring temperatures in the range of 2000 to 2100°F are conducive to the production of fine-grained metal, while pouring temperatures above 2150°F lead to coarseness (Fig. 3). The fluidity increases with small additions of nickel or with increased pouring temperature, as shown in Figs. 4 and 5. The desirability of maintaining low impurity contents for silicon, sulphur, aluminum, antimony and iron apply to pressure bronzes, and the debilitating effects upon mechanical and corrosion resisting properties of lead and zinc in amounts above 6 per cent of each have been mentioned previously.

The semi-red brasses with zinc contents exceeding 5 per cent may profit from a slightly oxidizing atmosphere during melting but need no oxidizing additions to the metal, unless it be in very small amounts, intended for agitation as well as oxidation.

Similar recommendations apply to the yellow brasses which contain 20 per cent zinc or more. Pouring temperatures in the range of 1900 to 2050° F seem conducive to optimum results.

Figs. 6 and 9 illustrate the grain refining action of nickel and the desirability of pouring yellow brass, particularly, at relatively low temperatures. To obtain a rapid solution of nickel in amounts of 2 per cent or less, a low melting point nickel-phosphorus alloy has been developed which may be added to the liquid metal just before pouring to effect a combined deoxidizing and grain-refining effect.

Fig. 7 (top right)—Illustrating castability of Ni-Vee type bronze pressure casting with a single riser. (Photo courtesy of Ely Portman)

Fig. 8 (below)—These three castings are pressure-tight leaded bronzes made with up to 2 per cent nickel (typical of compositions 15, 16, 17, Table II)

TABLE I—Pressure Bronzes in Common Use Alloyed with Small Amounts of Nickel

No.	Type	Application	Nickel	Copper	Tin	Lead	Zinc	Phos.	Tensile Strength	Yield Point	Elongation %	Bhn*
8	Fine grained	Pumps, valves, fittings, general purpose	1.50	83.50	5.00	5.00	5.00	0.02	38,000	17,000	34	73
9	High pressures	Pumps, valves, specialties	3.50	87.00	6.50	2.00	1.00	0.02	44,000	23,000	19	77
10	Very high pressures	Pumps, valves, specialties	3.50	88.00	6.50	.50 max	2.00	0.05	49,000	23,000	48	86
11	High strength and pressures Ni-Vee L5-Z5	Pumps, valves, fittings, etc.	5.00	Bal.	5.00	5.00	5.00	0.05	40,000	20,000	20	80
11HT	Heat treated† Ni-Vee L5-Z5	Pumps, valves, fittings, etc.	5.00	Bal.	5.00	5.00	5.00	0.05	50,000	30,000	5	120
12	Moderate pressures	Pumps, valves, fittings	1.00	85.00	4.00	3.00	7.00	0.02	35,000	17,000	27	62
13	Moderate pressures	Pumps, valves, fittings	1.50	85.00	3.50	5.00	5.00	0.03	36,000	15,000	30	71
14	Good strength, pressures	Pumps, valves, water and gas fittings	2.50	Bal.	2.50	5.00	5.00	0.05	35,000	17,000	30	60
15	Low pressure (81 Metal)	Plumbing goods, miscellaneous	1.00	Bal.	3.00	7.00	9.00	0.05	29,000	13,000	18	55
16	Moderate pressure (81 Metal)	Plumbing goods, valves and fittings	3.00	Bal.	3.00	7.00	9.00	0.05	32,000	15,000	20	58
17	High strength (81 Metal)	Plumbing goods, valves and fittings	5.00	Bal.	3.00	7.00	9.00	0.05	35,000	17,000	25	60
18	Semi-red brass, Leaded	Plumbing goods, low pressure work	1.00	Bal.	3.00	6.00	15.00	0.02	25,000	12,000	15	35
19	Semi-red brass, high leaded	Plumbing goods, refrigerator and gas fittings, etc.	2.00	77.00	5.00	10.00	6.00	0.02	30,000	16,000	20	55

† Heat treatment: 5-10 hr. at 550° F, air cool. * Brinell hardness obtained with 10-mm ball at 1000-kg load.

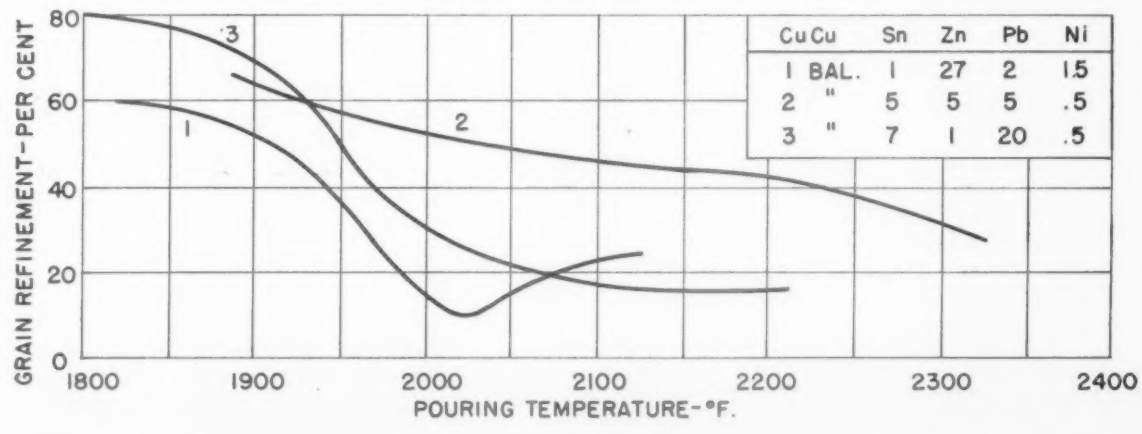

Fig. 9—Effect of pouring temperature on grain refinement of red and yellow brass

DETERMINATION OF Magnesium in Cast I

RECENT interest in nodular or ductile iron has added magnesium to the growing list of elements to be determined in ferrous metals, as this element is one of several to impart a nodular or spheroidal graphite structure to cast iron. While the routine examination of these alloys can be handled more quickly by spectrographic methods,[3, 5, 9] a chemical method of analysis is necessary for the independent checking of spectrographic standards in solid form and for use in laboratories not equipped for spectrochemical methods.

The method presented here can be outlined briefly as follows: The sample is dissolved in hydrochloric acid, and after oxidation the iron is removed as the chloride by ether extraction[7] in a continuous extractor [1, 8]. Magnesium and a part of the manganese are then precipitated as phosphates from an ammoniacal citrate solution[4]. The manganese is removed from the solution of the dissolved phosphate precipitate by precipitation as MnO_2 with ammonium persulfate from weakly acid solution[6]. The magnesium is then precipitated as the phosphate, ignited, and weighed as $Mg_2P_2O_7$. The weighed pyrophosphate precipitate is examined for calcium by the sulfate-ethanol procedure.

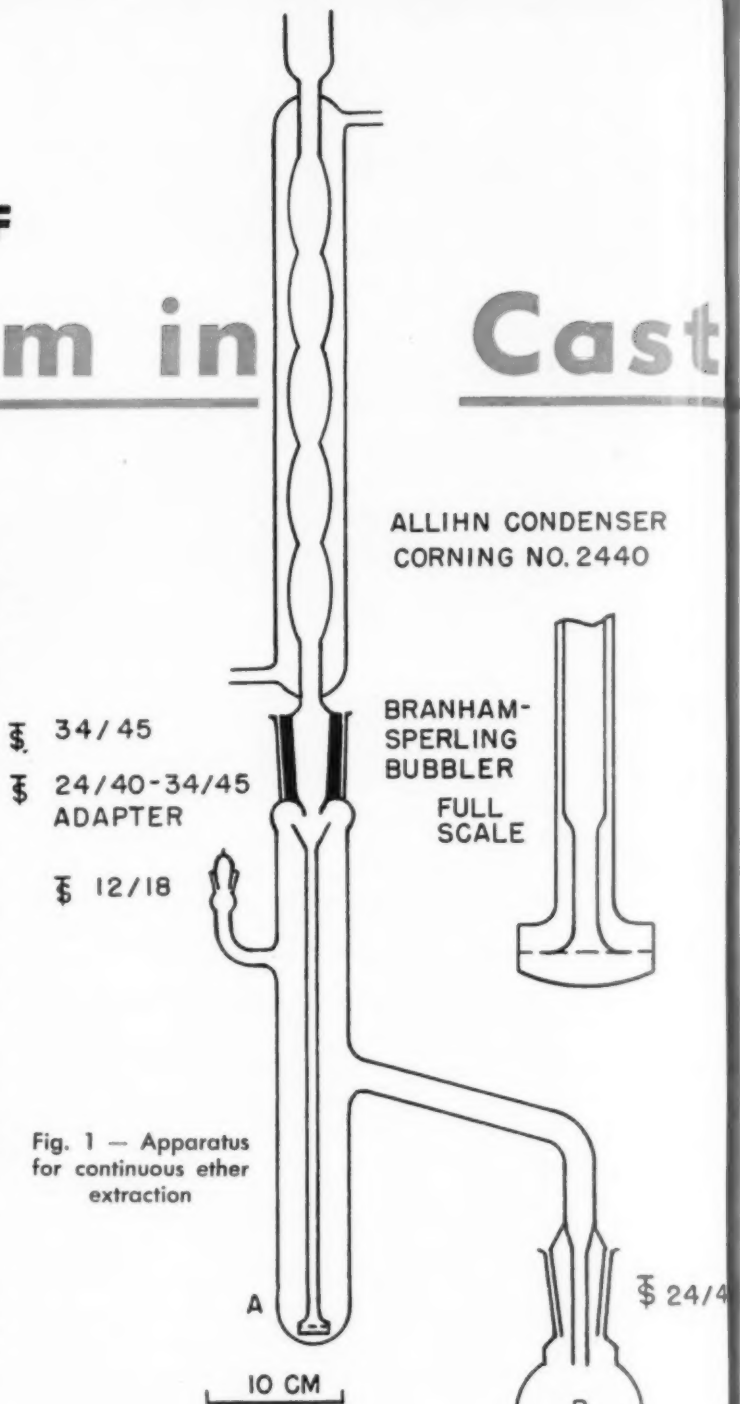

Fig. 1 — Apparatus for continuous ether extraction

Apparatus—The apparatus used for the continuous extraction is illustrated in figure 1. Several forms of apparatus [1, 8] designed for continuous extraction procedures using ether are commercially available (Scientific Glass Apparatus Co., Bloomfield, N. J.) and should be suitable for use in the present procedure. The Branham-Sperling[2] type of bubbler tube illustrated in Fig. 1 will disperse the ether in a fine spray of small droplets and is easier to keep clean than tubes fitted with glass frits.

Reagents—(a) Citric acid solution (250 grams per liter). Dissolve 250 grams of citric acid in 700 ml of water, add 10 ml of diluted H_2SO_4 (1:1),* and dilute to 1 liter.

(b) Ammonium phosphate solution (200 grams per liter). Dissolve 20 grams of diammonium hydrogen phosphate in 100 ml of water.

(c) Ammonium hydroxide-ammonium sulphate wash solution. Dissolve 20 g of ammonium sulphate in 1 liter of diluted NH_4OH (2:98).

(d) Ammonium hydroxide-ammonium persulfate wash solution. Dissolve 20 g of ammonium persulfate in 1 liter of diluted NH_4OH (2:98).

(e) Ethanol wash solution. Dilute 10 ml of H_2SO_4 to 1 liter with ethanol (90 to 95 percent).

Procedure—Transfer a 10-gram sample to a 600-ml beaker, add 100 ml of diluted HCl (1:1), and digest on a steam bath until solution is complete. Cool somewhat, cautiously oxidize with HNO_3 (sp gr 1.42, approximately 8 to 12 ml is required), and evaporate to dryness. Dissolve in a minimum (approximately 20 ml) of diluted HCl (1:1) with gentle heating. Add 75 ml of hot water, filter through a 9-cm loose-

*This denotes 1 volume of concentrated sulphuric acid, sp gr 1.84, diluted with 1 volume of water. Diluted hydrochloric acid (5:95) denotes 5 volumes of hydrochloric acid, sp gr 1.18, diluted with 95 volumes of water. If no dilution is specified, the concentrated reagent is meant.

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textured paper containing a little pulp, and wash alternately with hot diluted HCl (5:95) and hot water until most of the iron salts are removed, and then three times with hot water. Evaporate the filtrate and washings to a syrupy consistency on the steam bath, cool, dissolve in 50 ml of diluted HCl (1:1), and reserve.

Transfer the paper and precipitate to a platinum crucible, char and ignite at 850° to 900° C, treat with H_2SO_4-HF to eliminate silicon, and finally ignite at a low temperature. Fuse with 1 to 1.5 grams of $Na_2S_2O_7$. Dissolve the cooled melt in 15 ml of diluted HCl (1:1) and add to the filtrate.

Transfer the solution to a continuous ether extractor (*A*, Fig. 1) with the aid of 40 to 50 ml of diluted HCl (1:1) and extract with diethyl ether for 3 to 4 hours. The ferric iron collects in the receiving flask (*B*), which is originally charged with 100 ml of ether and 50 ml of diluted HCl (5:95). The magnesium remains in the acid solution. Transfer the extracted solution remaining in (*A*) to a 600-ml beaker, cautiously evaporate to remove residual ether, add 2 to 3 ml of HNO_3, and finally evaporate to dryness. Dissolve in 20 ml of diluted HCl (1:1), and transfer to a 300-ml Erlenmeyer flask. Dilute to 70 ml with water and boil 5 to 10 minutes.

Cool to 5° to 10° C in ice water, add 10 ml of citric acid solution, and 20 ml of ammonium phosphate solution. Make alkaline with NH_4OH, and add 10 to 12 ml in excess. Add several glass boiling-beads, stopper the flask, shake for 30 to 45 minutes, and allow to stand overnight. Filter on a 9-cm close-textured paper. Wash the flask and paper with the NH_4OH $-(NH_4)_2SO_4$ wash solution. Dissolve the precipitate on the filter and in the flask with 20 ml of hot diluted H_2SO_4 (5:95), catching the solution in a 250-ml beaker. Wash the filter paper with hot diluted H_2SO_4 (2:98). Adjust the volume to 100 ml, and nearly neutralize** with NH_4OH (approximately 4 to 6 ml suffices).

Add 2 g of $(NH_4)_2S_2O_8$, heat to boiling, and boil 3 to 5 minutes until MnO_2 is precipitated. Cool in a water bath. Filter the solution on a 9-cm close-textured paper containing a little paper pulp. Wash several times with NH_4OH-$(NH_4)_2S_2O_8$ wash solution.

** Adjust to approximately 1 per cent acid by volume of H_2SO_4. The proper quantity of ammonia can be conveniently determined on a blank.

Adjust the filtrate to 100 ml, add 1 ml of citric acid solution, cool to 5° to 10° C in ice water, and add NH_4OH slowly until the solution is slightly ammoniacal. Stir for 5 to 10 minutes, or until a crystalline precipitate appears, and then finally add 10 ml of NH_4OH. Allow the solution to stand in a cool place (room temperature or lower) overnight. Filter and wash the precipitate moderately with diluted NH_4OH (1:20).

Transfer the precipitate to a weighed platinum crucible and ignite at as low a temperature as possible until the carbon has been destroyed and the residue is white. Finally, ignite at 1050° C to constant weight. The difference in weight represents $Mg_2P_2O_7$ + $Ca_3(PO_4)_2$ + $Mn_2P_2O_7$*** and shall be corrected for calcium as directed in the following paragraph. (A blank carried through all steps of the procedure is normally less than 0.3 mg.)

Add 2.5 ml of diluted H_2SO_4 (1:1) to the residue in the crucible, transfer to a 250-ml beaker and thoroughly wash the crucible with water. Evaporate until dense white fumes appear. Cool, add 5 ml of water and 100 ml of ethanol (95 per cent), stir thoroughly for several minutes and allow to stand overnight in a cool place. Filter (*Please turn to page* 210)

*** In the normal process the amount of $Mn_2P_2O_7$ will not exceed 0.3 mg and can be neglected. If desired, a correction can be made by the KIO_4-photometric procedure.

TABLE I—Values Obtained on Synthetic Samples

NBS Standard Iron	Mg Added %	Ca Added %	Ce Added %	Mg Found %	Diff.
4g	0.010	....	....	0.011	0.001
				.012	.002
4g	020	....	....	.020	.000
				.019	.001
4g	020	0.020	....	.019	.001
				.022	.002
4g	020	....	0.020	.021	.001
				.021	.001
				.023	.003
82a	020	020	....	.022	.002
				.021	.001
4g	050	....	....	.047	.003
				.050	.000
				.050	.000
4g	050	....	0.050	.051	.001
				.052	.002
4g	070	....	....	.072	.002
4g	100	....	....	.103	.003

TABLE II—Values Obtained on Several Cast Irons Containing Magnesium

Sample No.	Magnesium, %
A	0.013
	.012
	.015
B	.021
	.014
	.015
	.016
C	.020
	.026
	.024
D	.044
	.047
E	.066
	.067
F	.096
	.097

Influence of Zirconium on Malleablization of White Cast Iron

In studying effects of zirconium on malleablization of white cast iron, the authors employed heats containing zirconium in amounts ranging from 0.054 to 0.329 per cent. Their investigations showed that the time necessary for complete solution of cementite at the upper critical was greater with increased amounts of zirconium. Specimens examined for second stage annealing effects were normal with respect to completion

THE use of various amounts of zirconium as additions to white cast iron has been studied from a qualitative viewpoint. The irons ranged from malleable cast iron to gray cast iron, depending on the composition of the heat and the amount of zirconium addition. However, information in the literature on the effect of zirconium on the annealing properties of white cast iron is very limited. The object of this investigation was to determine the effect of zirconium on the time necessary to affect graphitization and the complete solution of cementite during the first stage annealing and any stabilization of pearlite during the second stage annealing of white cast iron.

The first work on the use of zirconium in malleable iron was reported in 1920 by Moldenke.[1] The zirconium additions were considered from the viewpoint of deoxidation properties and varied from 0.05 to 0.15 per cent. An increase in strength was noted with increasing zirconium content but the higher percentage additions were described as causing considerable cooling and making pouring difficult. In 1933 zirconium was used to produce a gray iron from a standard malleable white iron. This work was reported by Riggan and Aufderhaar[2], with zirconium additions varying from zero to 1 per cent. A 0.70 per cent zirconium resulted in an iron having fine flake graphite. Its action was reported as being similar to that in steel usage where it acted as a deoxidizer and scavenger. A similar investigation was reported in 1934 by Hall.[3] The zirconium-treated irons were found to have fine grain and fine flake graphite structures. Hall also reported that the zirconium tended to improve fluidity of the heat in pouring.

Investigations conducted in 1934 by Schwartz[4] resulted in reports on zirconium as an active graphitizer in white cast iron. Zirconium contents of 0.21, 0.035 and 0.055 per cent were considered. The 0.21 zirconium had 0.60 per cent silicon and the other two heats contained 0.45 per cent silicon; both heats annealed readily with a tendency to be low. The author's explanation of "low" iron was an iron which contained too much carbon and silicon.

The present investigation was undertaken to increase the scope of available data and provide micrographic data on its graphitizing behavior.

Scope of Investigation—The experimental work was conducted on the basis of two variables: Zirconium content and the time necessary for the complete solution of cementite at the upper critical temperature of 1660° F.

The alloys chosen as a basis for investigation were:

Heat No.	Per Cent Zirconium
0	0.000
1	0.075
2	0.100
3	0.120
4	0.130
5	0.160
6	0.200
7	0.240
8	0.280
9	0.300
10	0.350

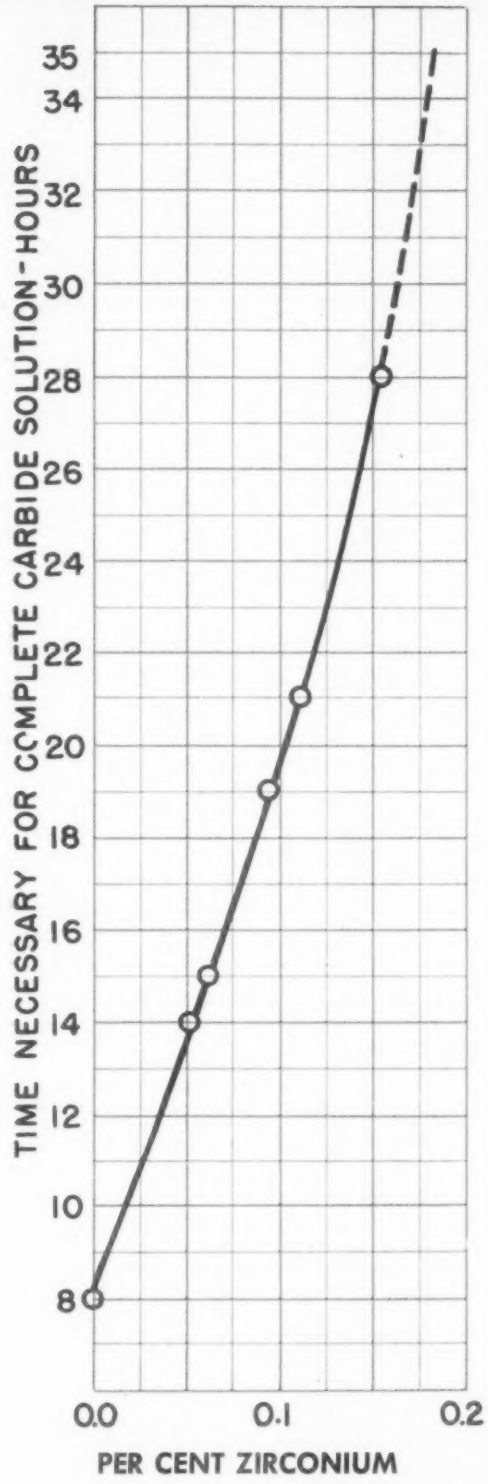

Fig. 1—Per cent zirconium vs time necessary for complete carbide solution

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Original plans called for an investigation of the lower annealing cycle, but on examining the specimens after the annealing treatment a large amount of scale was observed which indicated a failure of the furnace atmosphere. There was insufficient time to repeat the second stage annealing treatment of other specimens in the laboratory so a commercial annealing treatment was resorted to for the study of any effects on the second stage annealing treatment.

Theory—The process of converting white cast iron to malleable iron is essentially one of the alloy transformation from a metastable state to one of a stable state. The rate of transformation is increased by the application of energy in the form of heat.

Rapid cooling of a malleable iron heat produces non-equilibrium conditions which result in the metastable alloy of cementite and pearlite. Conversion to the stable state is affected by: Mechanisms of solution, nucleation, decomposition and diffusion; solution of the carbide in the gamma iron; decomposition of the carbide; nucleation of the carbon as graphite, and diffusion of carbon from the gamma iron to the graphite nuclei.

Heating of white cast iron into a temperature range of 1300° F to 1400° F results in a transformation of the pearlite into austenite and a structure of cementite in a matrix of austenite. Increasing the temperature permits the austenite to take greater amounts of the cementite into solution, until at the upper critical, in the range of 1600° F to 1800° F, the amount of cementite in solution is approximately twice the solubility just above the eutectoid temperature.

From the concepts of free-energy considerations applied to phase transitions, it is known that an excess of energy, known as the activation energy, is necessary to produce a transition from a metastable to a stable phase.[5] At the elevated temperature the activation energy is less than at room temperature and the transition to the stable state is more rapid. The elevated temperature holding period serves two pur-

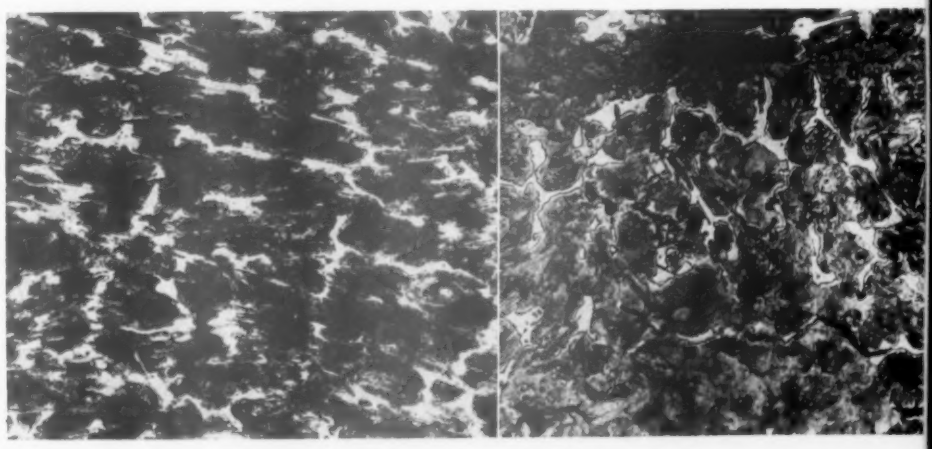

Fig. 2 (right)—As-cast specimen containing no zirconium. 150X; 3% nital etch

Fig. 3 (far right)—As-cast specimen, 0.295% zirconium. 150X, 3% nital etch

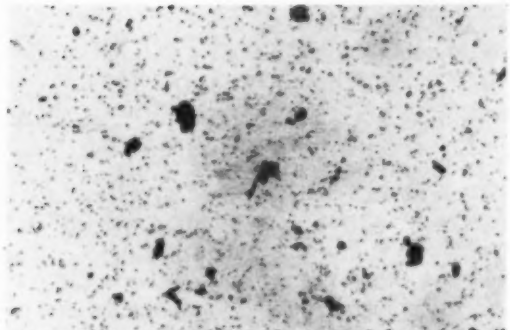

Fig. 4 — As-cast specimen 0.158% zirconium. 150X; no etch

poses: (1) permits a maximum solubility of carbon in gamma iron and (2) increases the nucleation of the graphite.

Once the carbon reaches the solubility limit in the gamma iron, carbides at the austenite-cementite interface create a carbon gradient with resulting supersaturation of the gamma iron. At the elevated temperature the supersaturation results in the nucleation of the carbon as graphite at the austenite-cementite interface. The process of carbide solution in the austenite, diffusion of the carbon to the graphite nuclei and growth of the temper carbon nodules continue until all of the massive carbides are in solution, at which point the upper annealing cycle is considered to be complete.

The iron, which now consists of graphite in a matrix of austenite, is rapidly cooled to 1400° F. The rapid cooling produces a supersaturation of the austenite and an increase in the carbon deposited on the temper carbon nodules. Slow cooling through the critical range, from 1400° F to 1320° F, results in the transformation of the austenite to eutectoid pearlite. Holding at a temperature just below the critical permits the cementite of the pearlite to spheroidize and eventually decompose into graphite and ferrite, the graphite becoming a part of the already existing temper carbon nodules. The lower annealing cycle is considered to be complete when the matrix is completely void of pearlite. The completely annealed iron consists of temper carbon nodules in a matrix of ferrite.

Theories as to why an element acts as a graphitizer or retarder of graphitization are vague. The effects of inoculating elements added to the ladle are known from the results they produce, but their mechanism of action is unknown.

Schneidewind and Reese[6] advance the theory that the carbon atom is forced out of the austenite lattice by the silicon. This would indicate that the silicon-gamma iron solid solution would have a lower solubility for the carbon than the gamma iron itself. This would follow the concepts of physical chemistry which have shown that the solubility of a solute in a solvent can be effected by the addition of a second solute. Under this argument, a graphitizing element can be one which reduces the solubility of carbon at a lower temperature or at an accelerated rate during the cooling of the heat.

Zirconium and iron form a solid solution of limited extent and at 40 atomic per cent zirconium a Fe_3Zr_2 compound exists.[7] Zirconium and carbon form a ZrC compound.[8]

Equipment and Materials—Equipment used during the investigation consisted of two basic units—a melting unit and an annealing unit. The melting unit was an Ajax-Northrup high-frequency induction furnace energized by a 35-kva mercury-arc generator with a power output of 15 kw. The crucible was capable of holding a 17-lb melt. The cracking unit consisted of a Leeds & Northrup hump furnace Vapocarb cracking unit. The furnace permitted easy removal of specimens with a temperature drop of only 10° F. The cracking unit utilized an electrically heated retort to vaporize the drops of Vapocarb fluid which provided the atmosphere for the hump furnace. To provide a neutral atmosphere during the annealing periods, a V flow of 35 to 40 drops per minute was utilized.

The crucible unit was prepared by using a magnesia crucible and granular magnesite as backing material. The granular magnesite was screened to minus 28 mesh, dried at 300° F a minimum of 12 hours and tamped in place in the base of the induction coil unit to a depth that would permit the crucible to project ¼-in. above the transite frame. The crucible was then centered within the induction coil and magnesite packed between the crucible and the sheet mica protecting the induction coil. After the crucible was completely packed it was checked to make certain it was centered with respect to the induction; this precaution was necessary to obviate hot spots during melting. The backing was sealed at the top with alundum cement, and the unit then was dried at 300° F a minimum of 12 hours.

Test Bars Poured in Green Sand

Raw materials used in the preparation of the Zirconium white iron heats were a commercial ferrozirconium of 35-40 per cent and an air furnace white iron analyzing: C—2.46, Si—1.12, Mn—0.35 and S—0.098.

The charge stock was cast into bars ¾-in. diameter by 12 in. long. Green sand molds were used and the bars were cast from one 150-lb bull ladle. The white iron was produced in a standard silica lined, coal fired, malleable air furnace. The cast rods were cleaned by shot blasting, ground to remove any fins or ingate projections and broken into 2-in. lengths for convenience in handling.

The pattern used for making the molds was a standard malleable iron test bar pattern consisting of two test bars gated from risers located at the heavy sections of the test bars. All the molds were green sand molds made from Albany sand having a moisture content of 6 per cent.

Melting and Casting—Initially it was the intention of the authors to make a series of heats to determine the recovery of zirconium in the melt, but since there was insufficient time to carry out this the first series of heats were used in the final work.

The white iron rods, 2-in. long, were packed in the crucible vertically and as close together as possible. The initial charge consisted of only the number of pieces which could be held in the crucible cross-sectional area. This procedure placed the cold charge well within the heating zone of the induction coil and resulted in complete and uniform heating. With the exception of the first heat melted in a new crucible, the procedure used in power application was: five minutes—4 kw; five minutes—8 kw; continuous—15 kw. Slower heating was employed with a new crucible. After the initial charge became molten, additional pieces of white iron were charged until the job was filled.

The amount of iron charged was in quantities that would not exceed the height of the induction coil. With each addition the power output was reduced to 10 kw to prevent overloading the induction unit. This procedure was followed until the entire charge had been melted. Refractory insulating brick was used as a crucible cover to minimize heat loss. Slag formation was negligible during melting, and it was unnecessary to remove any slag until just prior to pouring the heat. Temperature was obtained by optical pyrometer.

Poured into Preheated Ladle

The heat was superheated to 2950° F, skimmed of any slag and poured into a preheated ladle for alloy additions. In making the alloy addition, a pool of metal was permitted to collect in the bottom of the ladle, after which the ferrozirconium, crushed to approximately ⅛-in. size, was added in a thin stream. The heat was then cast into two green sand molds. Any excess metal was pigged. Temperature readings showed a heat loss of only 50° F from the time of skimming the slag to pouring the heat into the mold. The superheating was necessary to insure complete solution of the ferrozirconium. The alloy additions were made in the same manner for all heats with the exception of heat No. 2 in which the addition was made by tossing the alloy onto the heat surface in the crucible. The procedure was followed on the first heat made and proved very unsatisfactory from a recovery standpoint and resulted in the adoption of the previously described procedure.

Annealing—Specimens ½-in. long were cut from the heavy sections of the test bars for the annealing time determinations. Specimens from four heats were charged into the hump furnace while the furnace was cold. When the cracking unit reached 1300° F and the hump furnace 1400° F, the Vapocarb fluid was started and the atmosphere introduced into the furnace. The furnace reached the upper critical of 1660° F in three hours.

The time of reaching the upper critical was taken as the reference time for time at that temperature. Specimens were withdrawn from the furnace at various intervals and quenched in water. The specimens

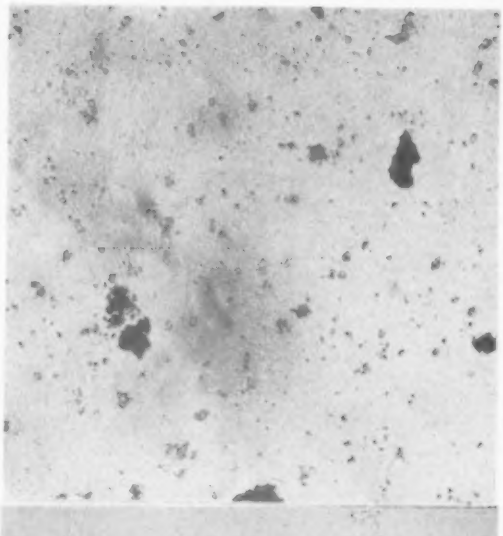

Fig. 5 — As-cast specimen, 0.210% zirconium. 150X; no etch

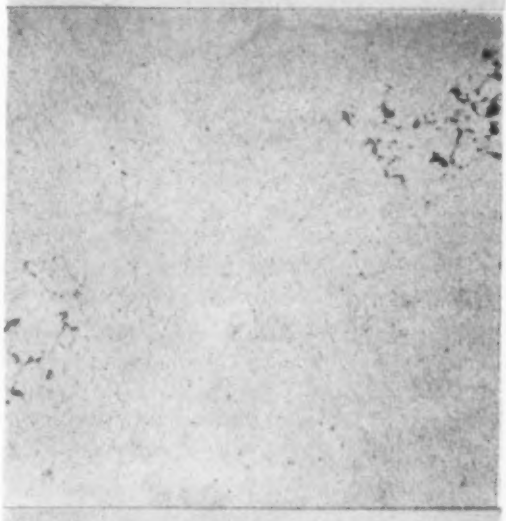

Fig. 6 — As-cast specimen, 0.242% zirconium. 150X; no etch

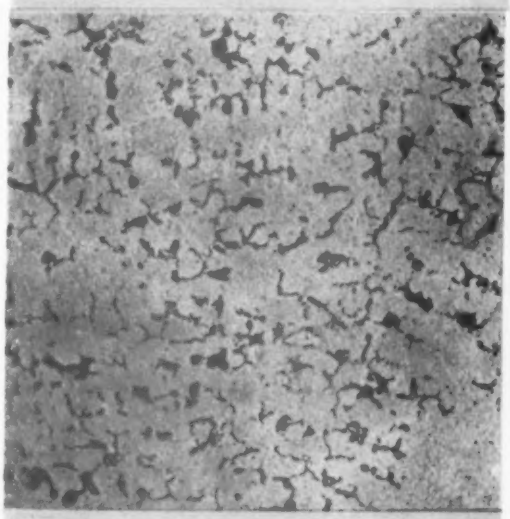

Fig. 7 — As-cast specimen, 0.295% zirconium. 150X; no etch

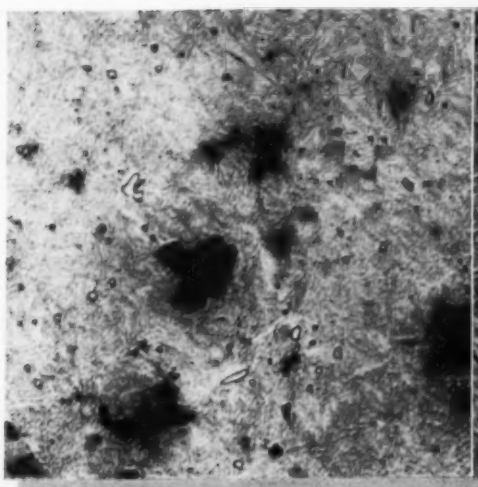

Fig. 8—0.054% zirconium. Eight hours at 1660°F. 250X; 3% nital etch

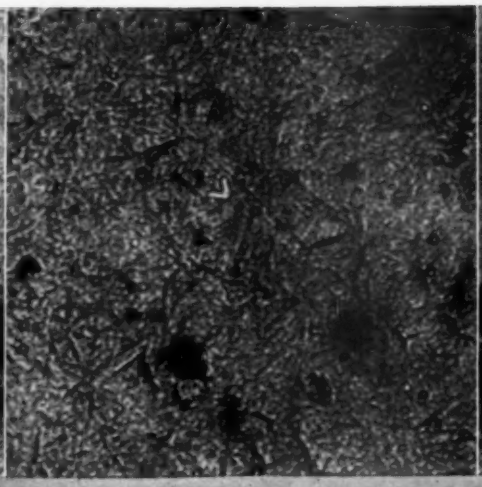

Fig. 9—0.054% zirconium. Fifteen hours at 1660°F. 250X; 3% nital etch

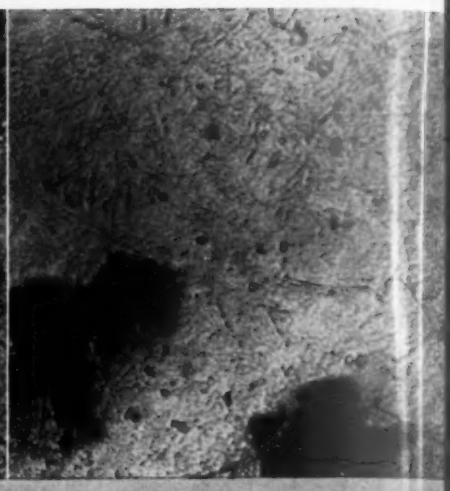

Fig. 10—0.054% zirconium. Seventeen hours at 1660°F. 250X; 3% nital etch

were then ground to remove approximately ⅛-in. of material from the surface to be examined microscopically. The specimens were then polished and etched for microscopic examination.

The specimens for studying the lower annealing effects were treated commercially with an upper holding time of 30 hours at 1660° F and a lower holding time of 18 hours at 1340° F. The same preparation of the specimens was used as described previously.

Metallography — Photomicrographs were taken of the as-cast specimens in the unetched and etched condition. Other photomicrographs were taken to show the criteria used for completion at the upper temperature and the effect on the second stage annealing.

Chemical Analysis—Carbon analysis was determined volumetrically. Silicon was determined by the sulphuric acid method and manganese by the persulphate-arsenite method. Zirconium analysis was determined by the cupferron method as described in ASTM methods of analysis.[9]

Considerable difficulty was encountered in getting the analysis samples into solution. The zirconium analyses required a long solution time but the subsequent procedure was relatively shorter. This lengthy solution time was also present in other analyses. For the silicon analysis the untreated white iron dissolved completely in approximately five to ten minutes, while the treated irons required a solution time of three hours.

Discussion—The two sets of data presented, that in Fig. 1 of the time necessary to attain complete solution of the carbides and the photomicrographs showing the increase in primary graphite with increased zirconium additions, seem to be contrary to one another. It is the authors' theory that the zirconium is acting both as a graphitizer and a carbide stabilizer.

Zirconium has a solubility in iron of approximately 0.5 per cent and with carbon it forms a carbide having the formula ZrC. With carbon and iron present it is reasonable to assume that these phases will be formed during the cooling of a white iron heat containing zirconium. The zirconium carbide would form very early in the cooling process since its heat of formation is very much greater than that of the iron carbide Fe_3C. The International Critical Tables give a heat of formation for ZrC as 34,800 gram calories per gram mol and that of Fe_3C as 5200 gram calories. This would place the zirconium carbides in the white iron at a very early time and favor their formation. The law of mass action would also enter into the picture and favor the formation of Fe_3C. Spectrographic analysis would have verified the presence of the zirconium but such facilities were not available.

The iron-zirconium equilibruim diagram shows that there is a solid solubility of zirconium in iron in a very small degree, less than 5 per cent according to Allibone and Sykes.[10]

This solubility starts at a temperature of approximately 2400° F and continues to room temperature. Assuming that the theory advanced by Schneidewind and Reese[6] is correct, there would be a combined action of silicon and zirconium going into solid solution and forcing the carbon atom out. The zirconium atom is also larger in size than the silicon atom and would as a result cause a greater distortion of the gamma lattice upon going into a substitutional solid solution—with a possible result of permitting the diffusion of the carbon with less energy than it would require without the added distortion. This combined action of the zirconium and silicon could well be the mechanism producing the primary graphite. Figs. 4 and 5 show the as-cast irons without an etch. These two examples are typical of the structures in the as-cast condition. Figs. 6 and 7 show the formation of dendritic graphite. This action was undoubtedly due to the increased silicon contents obtained from the ferrozirconium.

The time necessary for complete solution of the carbides at the upper critical increased very rapidly with increased amounts of zirconium. This action

Chemical Analyses of Individual Heats

Heat No.	Desired Zr %	Analyzed Zr %	Recovery Zr %	C %	Mn %	Si %
0	0.000	0.000	00.0	2.11	0.31	1.39
1	0.075	0.066	44.1	2.20	0.33	1.23
2	0.100	0.054	27.1	2.14	0.32	1.26
3	0.120	0.099	41.5	2.12	0.31	1.35
4	0.130	0.114	43.7	2.19	0.30	1.24
5	0.160	0.158	49.5	2.13	0.31	1.36
6	0.200	0.201	50.2	2.14	0.33	1.46
7	0.240	0.242	50.4	2.14	0.32	1.44
8	0.280	0.264	47.1	2.18	0.32	1.51
9	0.300	0.295	49.2	2.16	0.30	1.46
10	0.350	0.330	47.1	2.15	0.32	1.61

verified the theory of the formation of carbides which are more stable than cementite. It has been theorized that there might be carbides of compositions different than that of Fe_3C.[11] If such were the case, zirconium may be a stabilizer of a carbide which in itself is more stable than Fe_3C and result in the necessity for longer holding times at the upper critical.

The formation of the primary graphite may be related to the deoxidizing action of the zirconium which, combined with the solid solution in gamma iron, would result in the nucleation of graphite during solidification of the heat. It has been reported that deoxidation with zirconium results in a shorter annealing time.[3] Work in the very low percentages of zirconium is necessary to thoroughly evalute the beneficial effects.

Metallographic examination showed that zirconium was similar in its action in white iron to its scavenging action on sulphur in steels. Zirconium sulphide inclusions and a few zirconium nitride inclusions were found. There is some divergence of opinion in the published information used as a basis for identification. Information in the ASM *Metals Handbook* on nonmetallic inclusions in steel,[13] describes a zirconium sulphide as tan in color and cubic in structure; a zirconium nitride as cubic and yellow. Morrogh[14] describes a zirconium sulphide as a lighter gray than a manganese sulphide and of a stringy character. The absolute identification of these inclusions was beyond the scope of the investigation and was not pursued further.

Figs. 8 through 10 show photomicrographs of one heat as the carbides were going into solution. They are included to show the criteria used for determination of complete solution of the carbides at the upper critical. The photomicrographs in Figs. 8 and 9 show carbides and temper carbon in a matrix of martensite. The martensite structure was the result of the water quench used in the experimental work. The last photomicrograph shows a complete absence of carbides.

The criteria for any stabilization during the second annealing cycle was the presence of pearlite after 18 hours at the lower temperature. All of the specimens were completely free of pearlite and it can be assumed that there was no stabilizing effect on the eutectoid cementite. Fig. 11 shows the base heat after the complete annealing treatment. Fig. 12 shows heat No. 6 after the complete annealing treatment. The carbides shown in the photomicrographs are those which were not taken completely into solution by the holding time of 30 hours at the upper critical.

Fig. 11 — 0.000% zirconium. Complete anneal. 250X; 3% nital etch

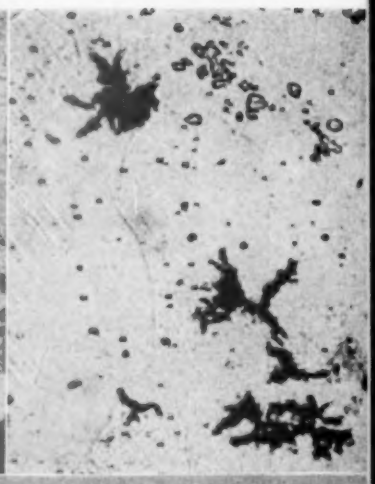

Fig. 12 — 0.201% zirconium. Complete anneal. 250X; 3% nital etch

Conclusions—

1. During cooling and solidification of a white cast iron heat, zirconium acts as an active graphitizer, producing primary graphite of an agglomerated structure.

2. The annealing time of white cast iron is greatly increased at the upper critical temperature with zirconium additions.

3. Zirconium additions have no effect on pearlite in the second stage annealing treatment.

Acknowledgments—The authors wish to acknowledge with sincere appreciation the co-operation in conduct of this work of Fred Pfarr, Lake City Malleable Co.; John N. Ludwig Jr., Electro Metallurgical Division of the Union Carbide & Carbon Corp.; and Prof. K. H. Donaldson, Dr. G. M. Cover and Edward Ulrich, Case Institute of Technology.

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Editor's Note: This paper is from a thesis submitted to Case Institute of Technology, Cleveland, in partial fulfillment of the requirements for the degree of Bachelor of Science in metallurgical engineering. It was presented at the third annual Ohio Regional Foundry Conference held in Cincinnati, Mar. 10-11.

Application of a Fluidity T

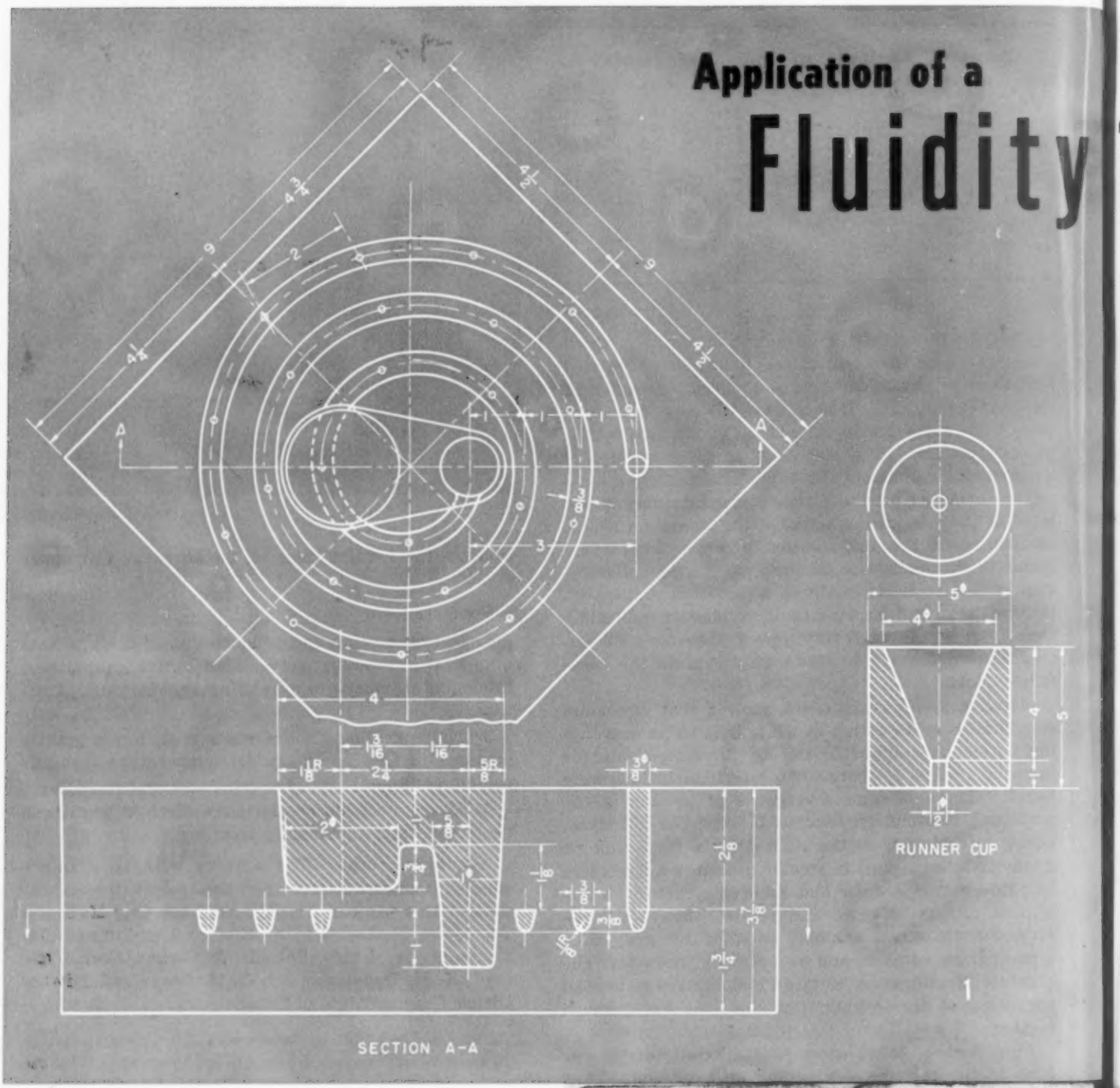

Fig. 1—Sketch of mold for steel fluidity test

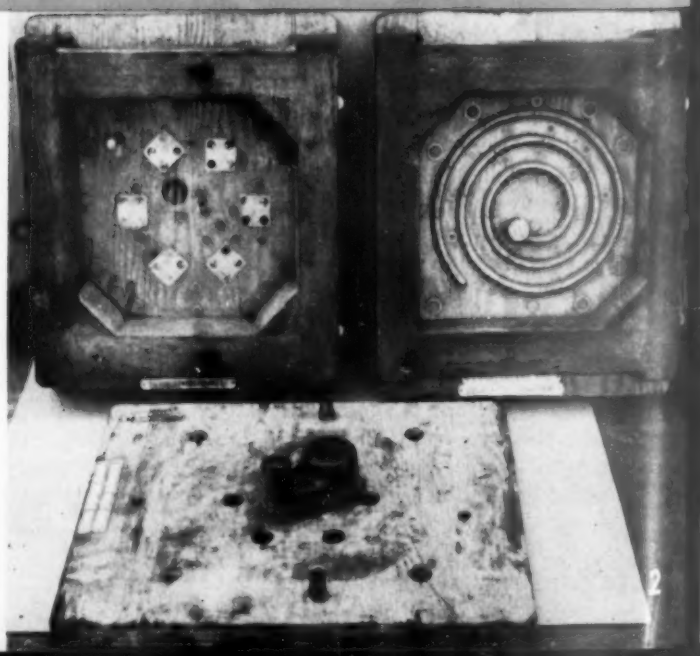

Fig. 2—Coreboxes used in making test mold

Fig. 3—Mold assembled, runner cup in place

Fig. 4—Disassembled components of the mold

Test Mold

Improved controls obtainable in the steel foundry through use of fluidity testing are described by the author. The test mold employed for this purpose is produced by a core blower and was developed primarily for ease in handling

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Metallurgist
Alloy Steels & Metals Co.
Los Angeles

THE FLUIDITY test mold was developed at Alloy Steel & Metals Co. primarily for ease in handling and to produce a mold at minimum cost by using a core blower. It differs chiefly from the present accepted fluidity test mold in that the spiral radiates from the center outward. This permits greater compactness in size and shape of the mold.

Fig. 1 shows details of the 9-in.-square fluidity mold. The total volume of metal occupied by the mold (well, runner, down gate, and spiral) was carefully calculated to equal the volume of metal that could be obtained with the sampling spoon used by the melter to extract metal from the furnace. The spoon used is a 4-in.-diam half sphere. Allowance in volume also was made for the slagging of the spoon. It was decided to use a ½-in.-diam opening at the bottom of the pouring cup to insure a constant rate of flow of the molten metal, provided the metal was poured from the spoon into the pouring cup instantaneously.

A two-piece wood box is used in making the mold, one piece being attached to the blow plate in a type "E" machine. Fig. 2 shows the completed coreboxes with plate.

Data for the core blowing are: (1) Setup time—15 minutes. (2) Amount of sand—2790 cc. (3) Three blows per minute. (4) Cost — approximately 1½ cents per complete mold (coremaker at $1.37½ cents per hour) when set up for 180 blows per hour. Fig. 4 shows the two completed halves of the core with the pouring cup.

The mold is assembled on the melting floor with runner cup on top and a measured 10 grams of 8-mesh ferrosilicon (85 per cent) put in the mold well to kill metal before entering spiral. Weight of spoon sample of molten metal is about 1400 grams. This would give a silicon addition of 0.60 per cent to the steel poured into the spiral. As all fluidity tests are made before alloy additions, it is necessary to add a reducing material to eliminate wildness in the metal and to absorb excess amount of iron oxide present. Fig. 3 shows the assembled mold ready for the test.

When the melter is ready to take the fluidity spiral test, he merely inserts the spoon into the furnace, extracts the molten metal sample and dumps it into the fluidity mold. It was thought that variations in speed of taking fluidity tests and possible change in rates of adsorption of the ferrosilicon in the mold well would distort the final results obtained. However, subsequent tests simultaneously made using a rountine planned method of handling the tests indicated a maximum error in results to be in the neighborhood of 1 in. differential. This would mean a potential error of 3 to 6 per cent, dependent upon the relative fluidity of the metal at the time the test was made. Fig. 5 illustrates the actual pouring of the test. The fluidity spiral test is shown in Fig. 6 after completion. Note the 2-in. increment pips on the spiral for easy counting by the melter.

A chart was developed in the metallurgical de-

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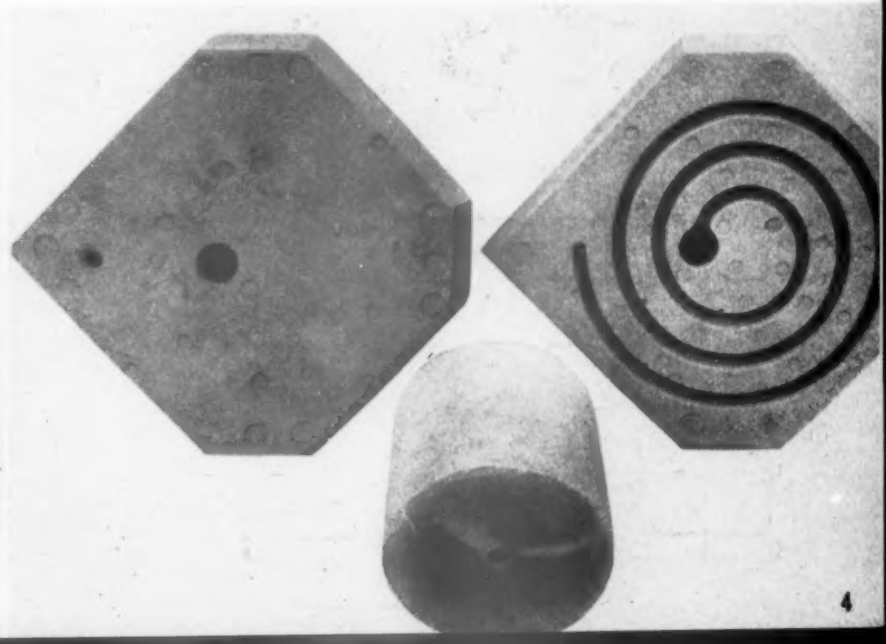

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partment showing fluidity necessary for different types of castings to be poured in the foundry. This chart is shown in Fig. 7. Section thickness of castings was plotted against fluidity in inches required to pour the job satisfactorily. Types of steel poured in the foundry were classified in two general categories as shown in the two separate curves. It is interesting to note that the austenitic type steels, 10-14 per cent Mn and the 18-8 class, required less fluidity to pour the same section thickness of casting than the low carbon, low alloy, pearlitic-type steels. Such factors as weight of casting, size and shape, number of ladle transfers of the metal (hand shanks, etc.) number of molds or stops—all affect the amount of fluidity necessary for that particular heat. Practice has so developed at Alloy Steel that the foundry foreman merely indicates to the melting department how many inches of fluidity he wants to pour a particular heat. It is up to the melting department to tap out at the required fluidity requested.

Since all fluidity tests are made before final alloy additions, allowance must be made for drop in fluidity with these additions. This factor is constant for the same type or analysis heat, and so many inches fluidity drop is automatically incorporated in arriving at the required fluidity. It is understandable that fluidity of molten steel is dependent upon many factors, chief of which is temperature. Before we started using the fluidity test, a temperature count in seconds was taken with a molten sample in a dry-sand, open-cup mold. Time was counted from the second the metal was poured into the mold until the metal started to skin over and freeze.

Both acid and basic furnace practice are used at this plant. It was observed that the temperature count on each furnace gave a wide range of results for the same type of metal melted and castings made. The temperature from heat to heat on the same furnace also varied with the same type of metal poured but varied to a lesser degree than between the acid and basic practice. This resulted in a certain amount of guesswork by the melter and gave him a feeling of insecurity and certain lack of confidence in his ability to turn out heats with good pouring qualities. It also resulted in high and unnecessary cleaning costs of the castings, due to misruns and burned-in sand conditions, as well as occasional skulling and stopping up of the ladles with corresponding high percentage of pigged metal lost to the foundry.

The development of fluidity testing on the melting floor eliminated substantially all of these difficulties and resulted in increased confidence, not only of the melters in their own ability, but that of the foundry as well. This has resulted in closer co-ordination and co-operation, as well as increased mutual respect between the foundry and melting department.

Because many factors influence fluidity, it was necessary to establish definite standards and close control over melting practice to achieve the desired results consistently. Slag condition, its relative volume and per cent of oxides present exert some influence on fluidity. Methods of making slag and furnace practice in electric furnace steelmaking will not be discussed here, but suffice to say it is extremely important to adhere to a definite melting practice to maintain as near constant values as possible for control of fluidity.

The fluidity test is remarkably accurate and for a given mold, conditions remaining the same, it makes no difference whether a 1025 steel or 18-8, either acid or basic practice, is used—the pouring characteristics of the particular metal will be the same, reducing considerably the dangers of hot tearing, burned-on sand, wrinkles, etc.

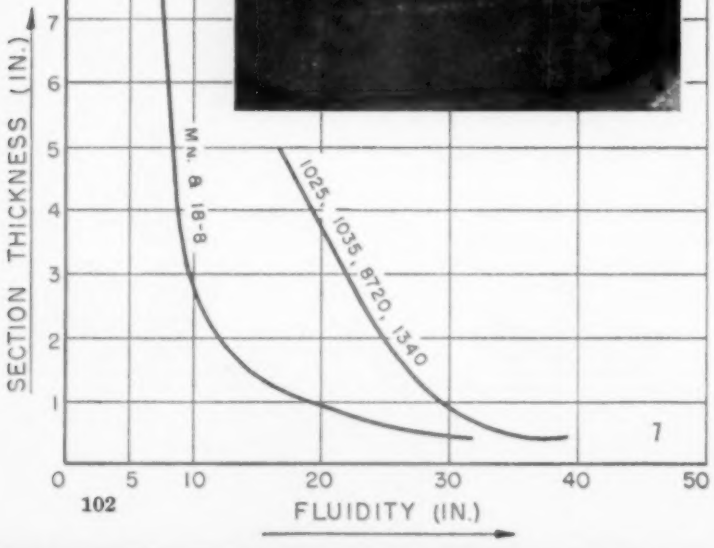

Fig. 5—Pouring molten steel in spiral test mold

Fig. 6—Spiral after solidification. Note 2-in. increment marks for measuring length of spiral

Fig. 7—Relation of section thickness to fluidity for satisfactory pouring of different type steels

Steel Foundry Core and Molding SANDS

Additional details on use of cement-bonded sand are given by the author. This is the seventh and concluding article of a series dealing with steel foundry sand practice. The first installment was presented in the April issue

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THE green compressive strength of cement-bonded sand is so low that it cannot be rammed as hard as sands bonded with clay or bentonite. If an effort is made to pound it really tight, it flows away from under the rammer more like loose dry sand than like a molding mixture. Therefore it is merely tamped enough to make sure it has filled details of pattern, and does not contain any uncompacted spots. For the same reason, it is not possible to lift a freshly rammed cope off a pattern without having the sand fall out. Flat backs, which are often rammed on a level piece of concrete floor, can be left to harden for 4 to 6 hours, after which they are strong enough to lift.

A cope containing recesses and irregular outlines, however, would drop if lifted as soon as rammed, and would not draw off the pattern if allowed to partially set. Small and medium sized castings, therefore, are usually molded in cores, which may either be rammed by hand, or jolted. In all but the smallest cores, rods are set in the sand as they are in using oil or pitch bonded mixtures. Usually, as a deep box is rammed up, rods are placed in courses separated by about 6 in. of sand. Most of the cores are made from patterns mounted on boards as in green or dry sand practice, a wooden frame being substituted for the flask.

Core Allowed To Dry on Plate

A heavy core plate with ample reinforcement and planed to a true surface, is set over the completed core, the whole clamped and rolled over, and the frame lifted off. The core is left on the plate for some 8 to 10 hours, after which it is removed and set down to air harden. Seventy-two hours after being rammed up, it is ready for use. The frames cannot be lifted off deep cores immediately, as the sand is too weak to support itself, and would collapse. In about an hour, however, the frame may be removed. This should be done as soon as the core is strong enough to stand up, because the sand becomes crumbly if it sets too long, and the finishers then have trouble in patching broken corners.

When set, cement-bonded sand is so hard that rubbing to a fit is very slow and tedious work. The cores, therefore, have to be true and fit closely together. For this reason, the core plates must be machined true and heavily reinforced to keep them from bending under the weight of a big core. If the assembled job is to consist of a number of cores, both horizontal and vertical joints must make a true fit. Because of this necessity of having perfect joints, there are very few fins on castings molded in cement-bonded sands. In fact, poor joints would result not simply in fins, but in bad run-outs; therefore they cannot be tolerated.

Few nails are needed on molds made of cement-bonded sand, except at places where the sand is to be exposed to flowing steel long enough to soften it and make it *wash*. At these areas, nailing is advisable. Brackets, when required, are hard to cut in the freshly-rammed mold, because the sand breaks off between adjacent brackets. To cut brackets in the hardened sand is difficult, and whenever possible a thin grinding wheel on a flexible shaft, or some similar tool is used for the purpose.

Guide pins and spools to prevent shifts when the cores are put together are sometimes molded directly into the sand, being set into properly located holes or pins in the pattern boards. When pouring pressures are not too high, the cores are simply held together with suitable clamps, set on small pieces of plate or wedged against the core itself. If the pressures are great enough to break unsupported cores and produce a run-out, plates and tie rods are used to give the mold more strength. On really deep jobs, flasks are set around the assembly and sand is rammed between them and the cores. Being merely external braces, these flasks need not fit each other well, and are not provided with pins. When necessary, binders and heavy tie rods may be used to hold the whole assembly strongly together.

To mend a broken corner on a dried mold, nails are driven into the sand, with part of their length sticking out to form a support for the patch. The surface of the broken place is wet down so that the fresh sand will adhere properly, and the patch is shaped up with the trowel. This sand should be allowed to air set, but if necessary a drying torch may be used to drive off the last of the moisture after partial hydration has taken place. The flame should not be applied to the fresh patch as it might eliminate too much of the moisture before it has had time to combine with the cement.

Some published articles state that clay tiles need not be used for the runners and gates of cement-sand molds. This is true of the smaller jobs, but on large castings runners molded in the sand are unsatisfactory, and tile should be used instead. At the temperature of liquid steel, cement-bonded sand softens so rapidly (*Please turn to page* 226)

EFFECT OF HYDROGEN on Mechanical Properties of Aluminum A

The authors' experiments indicate it is possible to study hydrogen solubility in a system containing water vapor. While there is no evidence that dissolved hydrogen embrittles aluminum, hydrogen which precipitates interdendritically when aluminum solidifies, markedly weakens the metal. Amounts of hydrogen less than that necessary to produce some pinhole porosity will yield microscopic interdendritic cavities which will decrease greatly the tensile strength and elongation of a 5 per cent silicon-aluminum alloy

IT HAS BEEN correctly claimed that there are relatively few reliable quantitative data on the effect of hydrogen on the properties and quality of commercial alloys.[1] This paper is an attempt to furnish some data and to check other data on the effect of hydrogen upon the mechanical properties of some commercial aluminum alloys.

It is commonly recognized that dissolved hydrogen which precipitates during solidification is the principal cause of pinhole porosity in foundry castings. Since the solubility of hydrogen in liquid aluminum under an atmosphere of dry hydrogen just above the melting point is low (about 0.7 cc per 100 grams of aluminum)[2, 4] it is improbable that this quantity can be responsible. It has been pointed out, however, that water vapor in the atmosphere above molten aluminum can result in high hydrogen solubility[2, 12] capable of causing such defects. Accordingly, hydrogen solubility measurements under an atmosphere of dry hydrogen cannot be applied directly to foundry practice where water vapor either from the atmosphere or as a product of gas combustion, or from wet ladles and refractories, plays the more important role.

The further question of how much hydrogen is necessary to cause changes in the mechanical properties has not been answered. The solubility of hydrogen in solid aluminum under dry hydrogen has been determined to be about 0.04 cc per 100 grams of aluminum[2, 3, 4] at a temperature just below the melting point. It is highly improbable that such a small amount would markedly affect the mechanical properties.

Some experimenters have shown that by subjecting an aluminum alloy to caustic attack the hydrogen content can be built up considerably above the equilibrium value, which is essentially nil at room temperature.[4] This paper deals in part with attempts to drive hydrogen into the metal lattice and the resulting effects upon the mechanical properties.

Previous Work—Experiments dealing with the effect of hydrogen, driven into the solid metal by immersion in sodium hydroxide solutions, upon the mechanical properties have yielded conflicting results. Moreau and Chaudron[5] report that pure aluminum, after standing in 0.01 N sodium hydroxide for several weeks, contained more than 1000 cc of hydrogen per 100 grams of metal. The modulus of elasticity increased to a maximum 8 per cent greater than normal after a 20-day treatment in the caustic soda solution and then decreased with longer treatment time. The modulus returned to normal when the hydrogen was removed from the sample. Electron bombardment was used to drive the hydrogen out of the metal.

Ransley and Neufeld[6], checking on the French investigators, submerged high-purity aluminum in 0.01 N sodium hydroxide and found that the metal absorbed 0.47 cc of hydrogen per 100 grams of aluminum. After the surface film was removed by machining, the metal still contained 0.43 cc per 100 grams. It is felt that the results obtained by electron bombardment are in error because of the high probability that the hydrogen reported came from bombardment of the glassware and the wax seals in the tube. The British workers used the vacuum fusion method which has been accepted as reliable.

No attempt will be made to summarize completely results reported in the literature showing the effect of gas porosity on the physical properties of aluminum. Most of the data are the result of tests made on castings containing varying degrees of porosity. Some writers have shown that hydrogen precipitated during solidification does markedly affect the mechanical properties[8]. It is reported that variations in the degree of pinhole porosity over the range common to standard foundry practice has very little effect on the mechanical properties[7]. The American Foundrymen's Society Subcommittee on Shrinkage and Porosity in Light Alloys[9] has summarized the causes and effects of gas porosity in detail. The literature can be summarized by saying that gas porosity is objectionable, whether or not it affects the mechanical properties of aluminum castings, be-

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es of Some n Alloys

cause it gives a blemished appearance especially on a machined surface and will prevent pressure tightness in thin sections of some alloys.

Effect of Water Vapor on Hydrogen Solubility of Aluminum and Aluminum-silicon Alloys — When there is water vapor in the atmosphere above molten aluminum, this reaction probably occurs:

$$3H_2O + 2\,Al \rightleftarrows Al_2O_3 + 6\,H$$

The partial pressure of monatomic hydrogen that can exist in equilibrium with water vapor is much greater than the partial pressure of monatomic hydrogen that can exist when diatomic hydrogen dissociates at the same temperature accordingly to the reaction: $H_2 = 2H$.

The reaction of water vapor with aluminum, then, would tend to force more hydrogen into solution. When the equilibrium amount (the amount of monatomic hydrogen in the metal in equilibrium with the diatomic hydrogen above the metal) is exceeded, the monatomic hydrogen in the metal will tend to form diatomic hydrogen and leave the melt. If this latter reaction is slower than the reaction to form monatomic hydrogen from the water vapor-aluminum reaction, there will be a build-up of hydrogen in the metal that is greater than the equilibrium amount under dry molecular hydrogen.

To study the effect of moisture upon the amount of hydrogen that will dissolve in liquid aluminum alloys, the apparatus shown in Fig. 1 was assembled. This is a modified Sieverts' type apparatus, which has been described thoroughly elsewhere[3, 4, 8, 10].

A high-purity aluminum and a 5 per cent silicon alloy were melted in a high-purity alumina crucible. The samples weighed about 125 grams. It was necessary to build the furnace assembly somewhat different than is usual for the Sieverts' type apparatus to permit a constant flow of the gas mixture containing the water vapor over the molten metal sample. This was done as shown in Fig. 1, using pyrex glass for the main bulb, the upper sealed-in pyrex tube containing the thermocouple and the gas inlet tube. This permitted the gas mixture to flow over the melt and down and out through the bottom of the outer tube to maintain a constant water vapor content in the gas mixture. The system could be isolated from the circulating gases by closing stopcocks *C* and *D*.

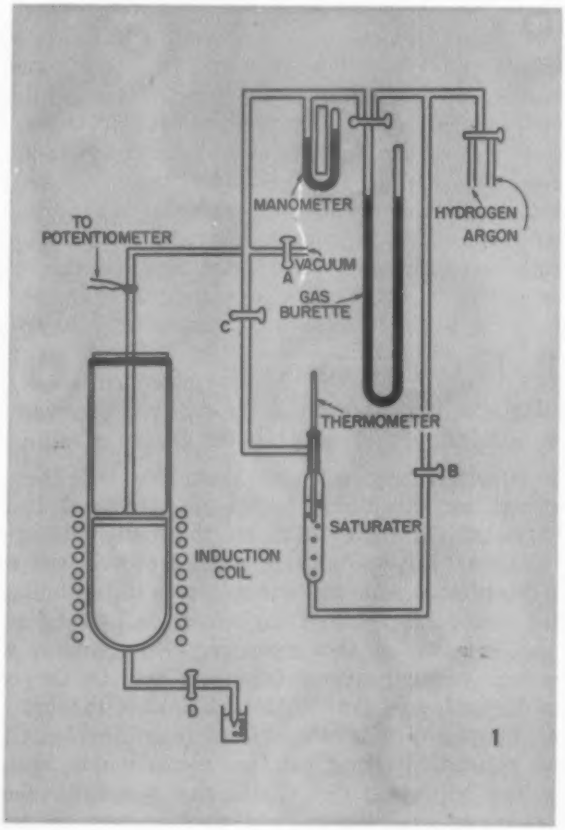


Fig. 1—Apparatus for determining hydrogen solubility of aluminum under wet hydrogen atmospheres

Air Blast To Cool Apparatus

It was necessary to cool the inner and outer pyrex tubes to keep them from softening. An air blast was effective in this respect. It kept the temperature of the bulb below the softening temperature (about 500° C), but did not cool the bulb or glassware enough to cause condensation of the moisture in the circulating gases. The treatments described in Table I were followed. By measuring the solubility under moist hydrogen at 700° C the results could be compared with measurements made previously at 700° C under dry hydrogen[2]. By evacuating for 15 seconds the pressure was reduced to less than 1 millimeter of mercury. The metal was then heated to a higher temperature to expel the gas more quickly and held at this temperature until the pressure of the system became constant. This reading was recorded. The rise in pressure is due to gas, assumed to be all hydrogen, coming out of solution.

To determine how much gas had come out of solution, the metal was degassed by evacuating the system for 15 minutes at 1000° C. Then hydrogen was let into the system from the burette until the previously recorded pressure was reached, at 1000° C, and was left in contact with the metal until the pressure of the system became constant. Gas going into solution in the metal caused the pressure to decrease, so it was necessary to introduce more gas to bring the pressure back to the value recorded when the gas was expelled from the specimen. When the pressure remained constant at the desired value, the change in volume of the burette along with the

TABLE I—Effect of Water Vapor on Amount of Gas that Will Dissolve in a 5 Per Cent Silicon-aluminum Alloy, at 700° C

Atmosphere	Gas Content (cc. per 100 g.)* Treatment 1	Treatment 2
Dry hydrogen	.73 ± .10	.59 ± .10
Moist hydrogen	3.53 ± .10	3.58 ± .10
Moist argon	1.82 ± .10	1.76 ± .10

* Not analyzed, but assumed to be hydrogen.

TABLE II—Mechanical Properties of 2S Aluminum Exposed to Hydrogen and Hydrogen-free Atmospheres

Treatment	Yield Strength 0.2% Offset	% Elongation in 1 in.
Exposed to hydrogen at 650° C for 24 hr	4,080	54.7
Exposed to vacuum for 24 hr at 650° C	4,040	50.0
Normal properties for fully annealed material*	5,000	45.0

* These values were taken from *Metals Handbook*, 1948 edition, p. 810.

TABLE III—Effect of Cathodic Charging in a 5% Sulphuric Acid Solution on Mechanical Properties of 2S Aluminum

HEAT A

Charging Time*	True Tensile Strength, psi	% Elongation in 1 in.
0 (as annealed)	49,300	47
2 hours	48,800	50
25 hours	50,000	38
25 hours	48,400	44

HEAT B

Charging Time*	True Tensile Strength, psi	Reduction in Area, per cent
0 (as annealed)	45,500	86
0 (as annealed)	46,000	86
30 minutes	42,800	84
2 hours	46,500	86

* All specimens were charged at 0.3 amp/sq in. Two different heats of rod stock were used. The marks for measuring elongation on heat B were obliterated, thus reduction in area values are given.

TABLE IV—Hydrogen Evolved from Cathodically Charged 2S Aluminum

Solution	Evolution* cc./100 grams	Loss in Weight by Solution of Al	Charging Time
5% H_2SO_4	none	0.01%	3 hours
5% H_2SO_4 plus P in CS_2	none	none	3 hours
5% NaOH	0.56	23%	24 hours
5% NaOH (no current thru cell)	0.69	....	24 hours
Same as above but washed in dilute HNO_3	0.35	....	24 hours
0.1 N NH_4OH	trace	0.9%	4 hours
0.1 N NaCL	trace	....	4 hours

* Evolution under butyl phthalate for 24 hours.

TABLE V—Effect of Cathodic Charging in 5% Sodium Hydroxide on Mechanical Properties of 2S Aluminum

Charging Time*	True Tensile Strength, psi	% Elongation in 1 in.
0 (as annealed)	49,300	47
0.5 hours	44,700	47
2 hours	43,700	50
4 hours	43,800	45
4.5 hours	43,200	44

* All specimens were charged at 0.75 amps/sq in. All were machined from rod stock from heat A.

TABLE VI—Description of Various Hydrogen Gassing Treatments

Treatment	Description
A	Degassed with argon for 5 minutes at 1450° F (788° C). Cooled to 1350° F (732° C) and poured.
B	Degassed with argon for 5 minutes at 1450° F (788° C). Gassed with dry hydrogen for 5 minutes at 1450° F. Cooled to 1350° F (732° C) and poured.
C	Degassed with argon for 5 minutes at 1450° F. Gassed with hydrogen bubbled through water (83° F) for 5 minutes at 1450° F. Cooled to 1350° F and poured.
D	Degassed with argon for 5 minutes at 1450° F. Gassed with a green stick for 5 minutes at 1450°. Cooled to 1350° F and poured.
E	Gassed with hydrogen for 5 minutes at 1450° F. Held for 5 minutes at 1450° F to allow some hydrogen to diffuse out. Cooled to 1350° F and poured.
F	Gassed with hydrogen for 5 minutes at 1450° F. Cooled to 1250° F (677° C) in 5 minutes. Held at 1250° F for 5 minutes. Reheated to 1450° F in 5 minutes. Cooled to 1350° F and poured.
G	Gassed with hydrogen for 5 minutes at 1450° F. Slowly solidified. Remelted and heated to 1450° F. Cooled to 1350° F and poured.

volumetric pressure and room temperature was read. From these readings, the amount of gas per 100 grams of metal could be calculated.

The results obtained when a 5 per cent silicon-aluminum alloy was exposed to various moisture containing atmospheres are contained in Table I. A description of the treatments used follows.

Treatment 1—The metal was degassed by holding it under a vacuum at 1000° C. The temperature was then dropped to 700° C and the metal exposed to the atmosphere of the test for 15 minutes. The system was closed and evacuated for 15 seconds. The vacuum pump was cut off from the system and the metal heated to 840° C. After holding at this temperature for 30 minutes, the pressure was noted.

Treatment 2—The metal was degassed and exposed to the atmosphere as in Treatment 1. It was allowed to solidify quickly. While the metal was solid the system was evacuated for 30 seconds. The metal was remelted and heated to 840° C with the vacuum pump cut off from the system. After holding at this temperature for 30 minutes, the pressure rise was noted.

Additional tests showed that when moist hydrogen was passed over pure aluminum at 732° C for 15 minutes and the system then evacuated, 4.45 cc of gas at standard conditions per 100 grams of metal were evolved. At 700° C, 3.89 cc per 100 grams were given off.

The hydrogen was bubbled through water at approximately 25° C in the above two experiments and in the experiments described in Table I. This was about 5° C below room temperature, so there was no condensation of moisture on the glassware.

The moist atmosphere experiments illustrate why aluminum and its alloys can and do absorb gas in amounts far greater than the equilibrium solubility values determined under atmospheres of pure hydrogen. Even when an inert atmosphere such as argon is used as a carrier for the water vapor, the partial pressure of monatomic hydrogen developed by the water vapor reacting with the aluminum is high enough to force more hydrogen into solution than when diatomic hydrogen dissociates. The values obtained for hydrogen solubility under dry hydrogen using the methods described in Table I compare very well with solubility values obtained using the regular Sieverts' apparatus for a 5 per cent silicon-aluminum alloy[2] (.7 cc per 100 grams of alloy).

It is interesting to note that most of the gas absorbed by the liquid metal was trapped in the solid metal. The air blast on the bulb caused the metal to solidify rapidly when the power was shut off. When dry or moist hydrogen was in the bulb, the metal cooled from 700° C to below the melting point of the eutectic in two minutes. When argon, with its much lower heat conductivity, was in the bulb, it took 8 minutes for the metal to cool through the same temperature interval. Most aluminum castings, when poured in either sand or metal molds, solidify in a few minutes. Very little gas has a chance to escape from the liquid into the atmosphere under these conditions.

When the metal was subjected to Treatment 2, no

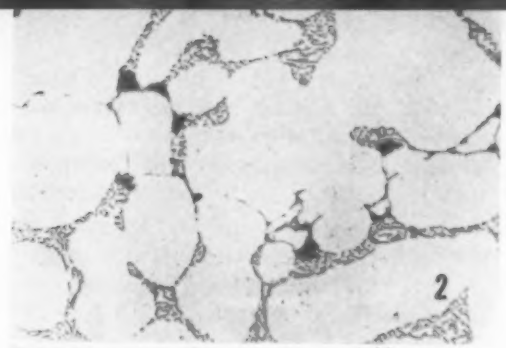


Fig. 2—Section from the sprue of heat B. High magnification required to note porosity. Density loss amounted to 1.79 per cent. Magnification 500X; Keller's etch

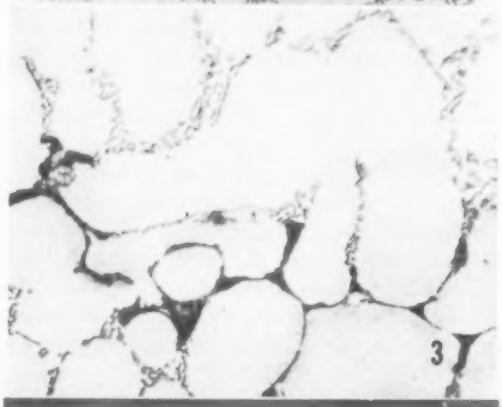


Fig. 3—Section from sprue of heat E. Some porosity visible to naked eye. Density loss 2.95 per cent. 500X; Keller's etch

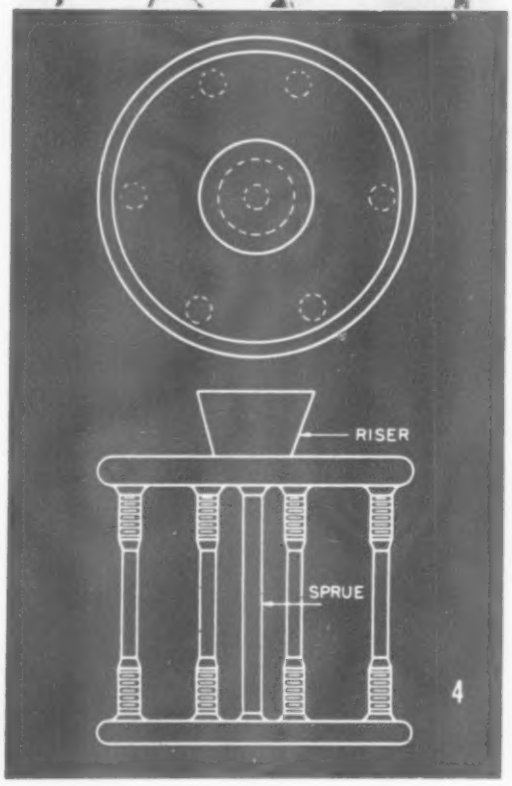


Fig. 4—Casting assembly of 0.250-in.-diameter tensile test bars. Bars were produced by the lost wax method

gas was evolved until the metal had remelted. This indicates that hydrogen evolves fairly slowly from solid aluminum. If the rise in pressure of the system was due to evaporating moisture condensed on the system walls, a rise in pressure would have been noted while the metal was solid.

The reaction between the atoms of hydrogen in solution to form diatomic hydrogen above the melt is evidently slower than the reaction to form monatomic hydrogen by reaction of the aluminum with water vapor. This could be due to the oxide layer present on the metal surface. Investigators using resistance heating report that the time for complete hydrogen evolution from liquid aluminum took from one to two hours[4]. When induction heating was used, however, the hydrogen could be removed from the metal in about 15 minutes. The induction stirring not only circulated the metal but broke up the oxide layer on the surface, intermittently exposing the metal surface to the atmosphere of the system.

A foundry melt of aluminum exposed to moisture and not properly degassed may have, based on the above data, amounts of dissolved hydrogen large enough to cause pinhole porosity.

The Effect of Hydrogen on Mechanical Properties of Aluminum—In an effort to determine the influence of hydrogen dissolved in solid aluminum on the mechanical properties, three procedures were tried: 1. Saturation of solid aluminum with hydrogen at a temperature just below the melting point, and quenching to retain the hydrogen. 2. Cathodic charging. 3. Pickling in sodium hydroxide.

From the solid solubility results [2, 3, 4] it was noted that about 0.04 cc of hydrogen would dissolve per 100 grams of high purity aluminum at 650° C. Furthermore, results reported indicated that at temperatures below about 300° C the rate of diffusion of hydrogen out of aluminum was very slow[10]. It seems, then, that a small amount of hydrogen can be trapped in the metal lattice by saturating the aluminum at a temperature close to, but just below, the melting point and then quenching.

When aluminum is made the cathode in an electrolytic cell or exposed to a caustic solution, as in a pickling operation, hydrogen is liberated at the metal surface. The partial pressure of monatomic hydrogen in systems such as this is extremely high, and high solubilities of hydrogen in the metal might be expected.

Apparatus—Specimens with a 1-in. gage length, 0.250-in. diameter, were machined from 2S aluminum rod and sealed inside of a pyrex No. 172 bulb, this bulb being held inside of an electrical resistance furnace equipped with a constant temperature controller. The bulb was attached by pyrex tubing to a gas burette and an open tube mercury manometer. Hydrogen could be let into the bulb through the gas burette, and the bulb and manometer could be evacuated by a mechanical pump.

The electrolytic cell consisted of a circular sheet metal anode (lead was used for acid electrolytes and iron for basic electrolytes), a battery jar to contain the electrolyte, and a cathode consisting of a machined 2S specimen threaded into a 2S aluminum specimen holder. The flow of current was regulated by a variable resistance.

Procedure and Results—One machined specimen was heated to 650° C and held under a vacuum for 48 hours and then removed from the furnace and pulled in a tensile machine as soon as it had reached

room temperature. Another sample was exposed to a vacuum for 48 hours and then to hydrogen at one atmosphere for an additional 24 hours, also at 650° C. Two different samples were used for each test. The average results for the yield strength and elongation are included in Table II.

The specimens treated in the sulphuric acid solutions were from two different heats of 2S aluminum and were annealed together for one hour at 340° C. In an effort to determine if hydrogen was being forced into solution, after the samples were cathodically charged, they were placed under a column of butyl phthalate and the evolved gas measured. The column was calibrated so that the volume of gas in the tube was known.

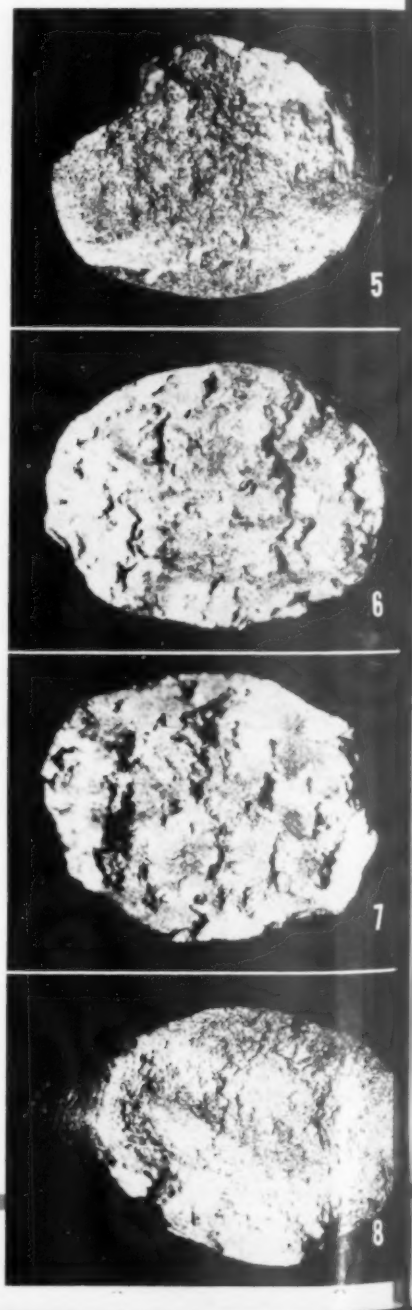
Charging in sulphuric acid failed to yield a specimen that would evolve gas. Various "poisons" such as phosphorus dissolved in carbon disulphide, were added to the acid, but no evidence of hydrogen evolution under the butyl phthalate could be noted. The purpose of the "poison" was to build the pressure of monatomic hydrogen higher by making bubble formation more difficult. A number of additional specimens were charged for different lengths of time from ½ to 25 hours and then subjected to the true stress-true strain test[11]. The results are listed in Table III.

Samples annealed the same as for the sulphuric acid tests were charged in various sodium hydroxide solutions and the subsequent hydrogen evolution noted under the liquid column. Table IV contains the values for gas evolution (assumed to be hydrogen) when specimens were subjected to different treatments. The storage time under the butyl phthalate was 24 hours in all cases. Evolution usually ceased after about 4 hours. Mechanical property data, using the same procedure as for the acid charged samples, are shown in Table V. Care had to be taken to remove all traces of sodium hydroxide from the sample before it was stored under the liquid column. Any sodium hydroxide left on the sample would react with the aluminum to form hydrogen. To prevent this reaction, the specimens were washed in water and acetone, then dried in air before being placed under the column.

TABLE VII—Effect of Various Gassing Treatments on Physical Properties of a 5% Silicon-aluminum Alloy when Tested 1 Hour, 2 Days, and 10 Days After Casting

Specimen No.	Treatment	Sprue Density	% Porosity	Elongation in 1 in.	True Tensile Strength, psi	% Reduction in Area	Holding Time
1	A	2.684	0.20	15.6	33,200	22.3	1 hr
2*	A	2.684	0.20	14.1	31,700	20.2	1 hr
3	B	2.642	1.79	6.2	24,400	10.8	1 hr
4	B	2.642	1.79	7.8	21,800	6.6	1 hr
5*	B	2.642	1.79	...	.....	11.6	2 days
6*	B	2.642	1.79	7.8	23,900	11.5	2 days
7	B	2.642	1.79	8.0	28,800	16.2	10 days
8	B	2.642	1.79	7.0	27,000	15.8	10 days
9	C	2.629	2.25	7.8	26,400	15.4	1 hr
10	C	2.629	2.25	7.8	25,500	13.8	1 hr
11	C	2.629	2.25	4.9	22,900	9.2	2 days
12	C	2.629	2.25	7.9	25,500	13.5	2 days
13**	C	2.629	2.25	...	.....	...	10 days
14**	C	2.629	2.25	6.0	.....	2.2	10 days
15	D	2.624	2.45	6.2	30,400	23.8	1 hr
16	D	2.624	2.45	6.2	21,200	7.5	1 hr
17	D	2.624	2.45	6.2	27,600	18.5	2 days
18	D	2.624	2.45	9.4	27,600	18.7	2 days
19	D	2.624	2.45	6.0	24,200	13.2	10 days
21	E	2.611	2.95	9.0	23,200	11.2	1 hr
22	E	2.611	2.95	7.0	.....	...	1 hr
23	E	2.611	2.95	8.0	22,200	10.1	2 days
24	E	2.611	2.95	6.0	21,500	8.4	2 days
25	E	2.611	2.95	4.0	21,500	6.9	10 days
26	E	2.611	2.95	8.0	24,200	11.8	10 days
27	F	2.680	0.36	10.0	30,200	15.3	1 hr
28	F	2.680	0.36	16.0	35,000	26.3	1 hr
29	F	2.680	0.36	11.0	28,000	16.4	2 days
30	F	2.680	0.36	12.0	29,300	15.9	2 days
31	F	2.680	0.36	13.0	31,200	23.3	10 days
32	F	2.680	0.36	15.0	32,400	27.7	10 days
33	G	2.686	0.15	13.0	33,000	28.4	1 hr
34	G	2.686	0.15	14.0	30,600	21.3	1 hr
35	G	2.686	0.15	14.0	32,000	19.8	2 days
36	G	2.686	0.15	17.0	37,000	23.6	2 days
37†	G	2.686	0.15	3.0	29,000	17.1	10 days
38	G	2.686	0.15	14.0	32,000	24.3	10 days

* Specimens 2, 5 and 6 had small oxide inclusions at the point of fracture.
** Specimens 13 and 14 had large oxide inclusions at the point of fracture.
† Specimen 37 broke at surface indentation.
All of the above mentioned imperfections caused low mechanical property values.



Discussion of Results—It can be concluded, from the data in this section, that hydrogen charged into solid aluminum in the amounts shown does not noticeably embrittle aluminum. This is probably due to the very small amount that the lattice will hold. In the sodium hydroxide solutions, the metal seems to absorb some hydrogen but there is no measurable effect on the mechanical properties. The elongations of the specimens charged for the longest periods of time are the smallest, but the difference between the charged and uncharged samples is within experimental error. The fractures and manner of failure were the same for all specimens.

The sample pickled in sodium hydroxide appeared to pick up as much hydrogen as the samples charged in the electrolytic cell. Washing with nitric acid after the caustic immersion decreased the amount of hydrogen evolved, but this is based on but one test. When hydrogen is released at the metal surface in an acid solution a protective layer, probably Al_2O_3, seems to prevent hydrogen penetration. This barrier is either not formed or is dissolved in an alkaline solution such as sodium hydroxide. The values for hydrogen evolution after immersion in sodium hydroxide compare closely with those reported by Ransley and Neufeld[6].

The high ductility values reported in Table II for the samples exposed to hydrogen and hydrogen-free atmospheres are due to the large grain size imparted to the material by this high-temperature anneal. These samples yielded in a manner similar to a single crystal.

Effect of Gas Porosity on Mechanical Properties of Aluminum Alloys—A 5 per cent silicon-aluminum alloy (Alcoa No. 43) was chosen to make gas porosity tests because studies made previously indicated that the solubility of hydrogen is greater in aluminum-silicon than in aluminum-copper alloys[2]. All of the melts were made from the same 30-pound ingot. Each heat consisted of about 500 grams and was melted by induction in an alumina crucible. This type of melting avoided contamination of the melt by furnace gases such as is encountered in a foundry using oil-fired or gas-fired melting pots. Seven different gassing treatments were tried in an effort to produce castings with varying degrees of gas porosity. The treatments *A* and *G* (Table VI) were tried to obtain low gas content. Treatments *B*, *C*, and *D* were used to get a great deal of gas into the metal, and treatments *E* and *F* allowed some of the gas to diffuse out of the molten metal, producing castings with a small degree of gas porosity. The pouring temperature was kept constant at 1350° F (732° C) so that the grain size and dendritic pattern of all of the castings would be the same. Temperatures were measured by means of a chromel-alumel thermocouple attached to a portable potentiometer.

The molds were made by the investment process. The wax pattern consisted of six test bars mounted vertically between two circular gates. A sprue, or down gate, connected the two horizontal gates at their centers and a large riser was placed on the upper circular gate just above the sprue (Fig. 4).

A hand-operated tensile wire tester was used to test the specimens. The load could be read to 2 pounds. The true stress-true strain method of testing as described by MacGregor[11] was used. The changing diameter of the test bar was measured by a snap gage that could be read to half of a thousandth of an inch.

The metal in the molds solidified within a minute after pouring, and after the bars had cooled to room temperature two from each mold were pulled. The average time between pouring and testing was one hour. To determine if hydrogen was diffusing out of the test bars over a period of time, tensile tests were made on bars which were left at room temperature for 2 and for 10 days after casting.

The tensile data and the results of the density measurements are included in Table VII. The density measurements were made by weighing the test pieces in air and then in water. The specimens were carefully washed in benzene, alcohol, and ether in that order to clean them thoroughly. The densities were accurate to the third decimal place.

Discussion of Physical Property Results (Castings)—There is no doubt that precipitated hydrogen or defects due to precipitated hydrogen have a marked effect on the mechanical properties of the particular alloy studied. It lowers the tensile strength and decreases the ductility by coming out of solution and forming gas pockets at the dendrite boundaries. Under the test conditions the metal solidified very rapidly because of the small section of the test bars. Therefore, there was little chance for the gas to form into large bubbles and to be trapped as such, giving the appearance common to severe macroscopic "pinhole" porosity as found in aluminum castings of large section. At 500 X the cavities resulting from the hydrogen being forced to the dendrite boundaries can be seen in the accompanying figures.

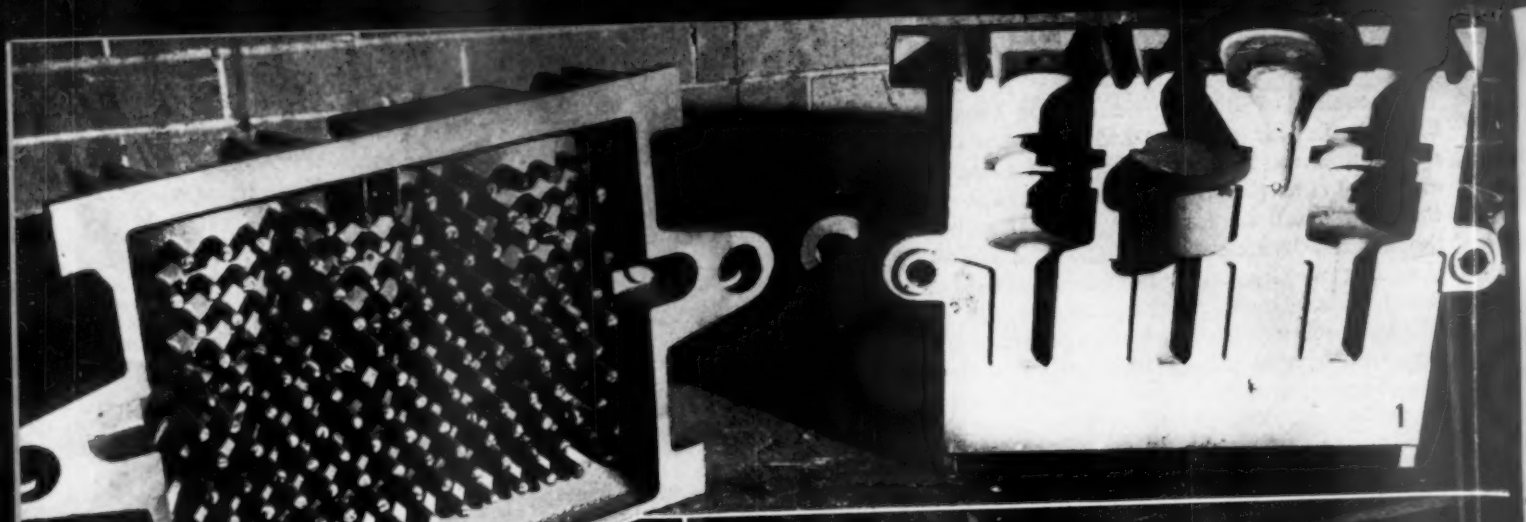
Fig. 2 shows the fine interdendritic fissure which resulted when the alloy had treatment *B*, which resulted in a small density decrease. Fig. 3 shows the type of interdendritic fissuring when treatment *E* was used, resulting in a large decrease in density. Treatment *E* gives very obvious pinhole porosity whereas treatment *B* might not show macroscopic pinhole porosity. The important feature to notice, however, is that either treatment results in almost the same serious deterioration in mechanical properties. It must follow, therefore, that the very fine interdendritic fissures in Fig. 2 (*Please turn to page* 209)

Fig. 5—Fracture of test bar No. 1. Degassed with argon. Tensile strength 33,200 psi. Elongation 15.6 per cent in 1 in. Magnification 5X

Fig. 6—Fracture of test bar No. 3. Gassed with dry hydrogen. Tensile strength 24,400 psi. Elongation 6.2 per cent in 1 in. Magnification 5X

Fig. 7—Fracture of test bar No. 16. Gassed with moist hydrogen. Tensile strength 21,200 psi. Elongation 6.2 per cent in 1 in. Magnification 5X

Fig. 8—Fracture of test bar No. 35. Degassed by solidification and remelting. Tensile strength 32,000 psi. Elongation 14 per cent in 1 in. 5X



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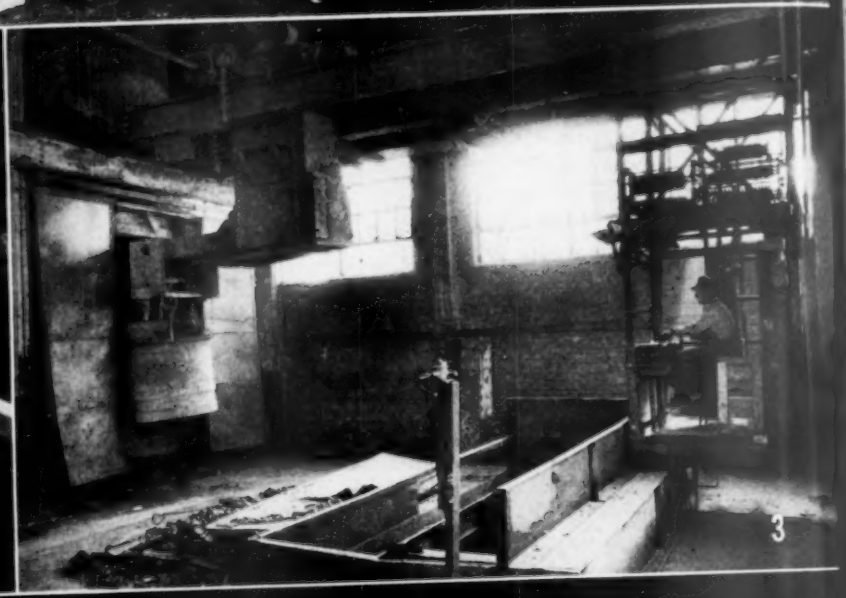

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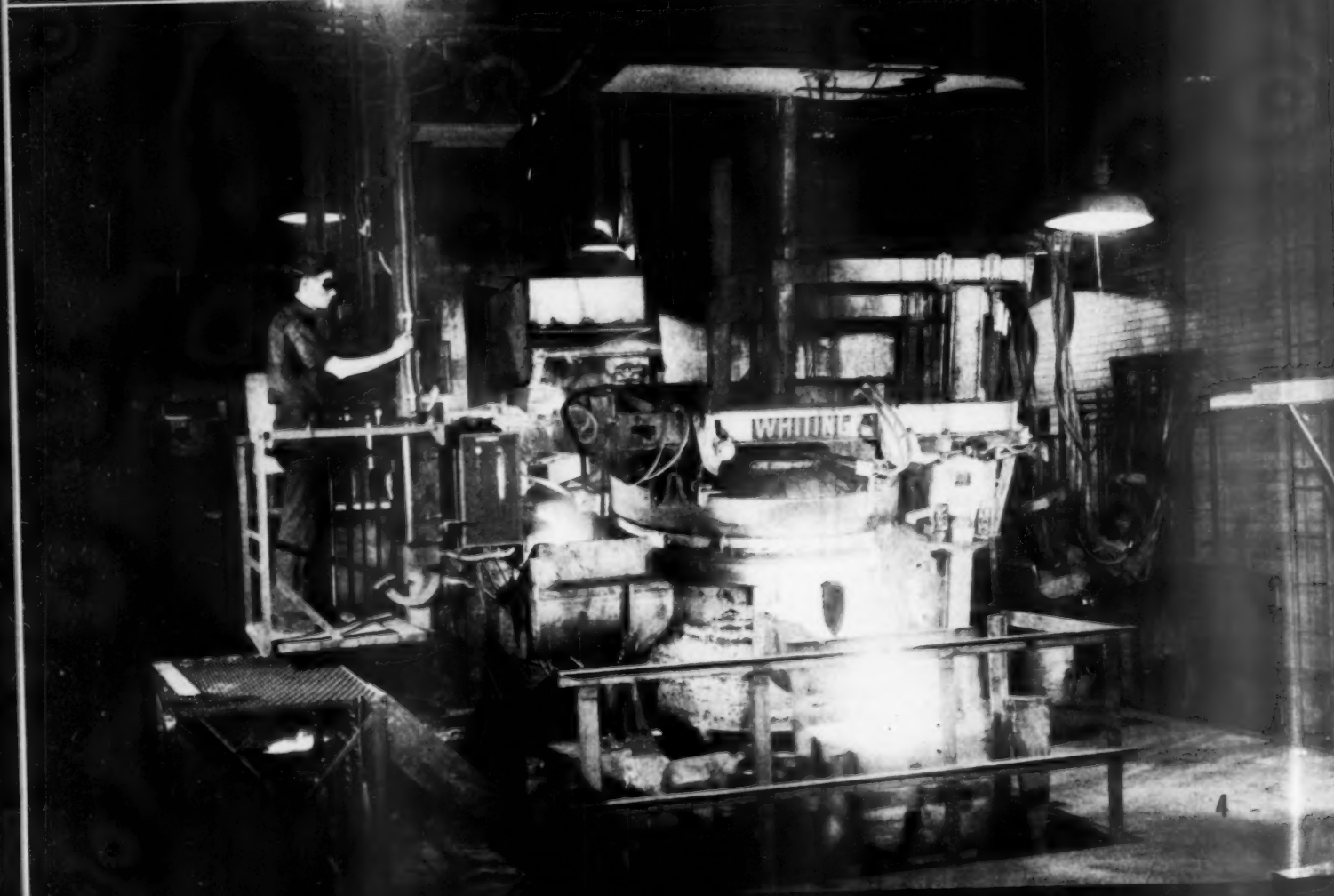

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By HERBERT CHASE

Permanent Mold Casting

OF GRAY IRON

ONE of the few captive foundries making permanent mold gray iron castings is that operated by the Delco Remy Division, General Motors Corp., Anderson, Ind. Although this is not a large foundry, it has a high output—some 45,000 castings per day. When data for this article were obtained, eight casting machines were in use and four new ones were in process of erection.

Aside from high output, noteworthy features of this foundry include excellent methods of preparing and handling metal and of handling, heat-treating and clearing castings after they are ejected from the permanent molds. All handling is done on conveyors or through machines which take bulk loads.

About 95 per cent of the castings produced require sand cores. These are made, baked and handled efficiently on a basis paralleling the large-scale preparation of dry sand cores for sand molds in well equipped sand foundries. Sand cores are set into the permanent molds rapidly by hand and in step, of course, with the rotary machines that operate the molds and carry them through their rapid repetitive cycle.

Castings produced average about 3 lb in weight. Sections range from 3/16 to 1⅛ in., the average thickness approximating ⅜-in. In most cases it is possible to hold dimensions within ±1/32 in. if so specified. Dimensions hardest to hold closely are those across mold partings and these, as well as other dimensions, are affected to some extent by the building up of soot which is applied by a flame in each casting cycle largely to protect the mold surface and make ejection of castings easier.

Castings average somewhat smoother than those produced from gray iron in sand molds and, for a given analysis, strength runs about 10,000 psi higher than for sand castings.

Most of the castings produced are used in starting, lighting and ignition equipment in which high physicals are not required. The chief reason for using permanent molds is high economy. Unlike sand casting, the molds are used repeatedly and are operated automatically. Although sand cores are required, the total sand handled is only a small fraction of that used in sand molds and no attempt is made to reuse the sand.

Metal molds are sand cast in two halves from iron melted in a small electric furnace. Small amounts of nickel and chromium are added to give the molds desired heat resistant qualities. Most molds have two to four cavities. The molds have cavities cored with allowance for machining to size. This is true also of the prints into which sand cores are set when the molds are used. Machining of molds requires skilled labor but the work is less exacting than most die sinking. This work approximates that on permanent molds used for aluminum, and the surfaces exposed to molten metal are given a similar coating of refractory French chalk after machining is completed.

Mold walls average about ½-in. thick and, as shown in Fig. 1, the back face (the face away from the parting) is covered with integrally cast pins projecting into a box through which cool air is constantly circulated when the mold is in the casting machine. This air picks up the heat conducted through mold walls to the cooling pins and carries the heat away. Forced air cooling keeps the molds at a moderate working temperature, effecting the heat absorption necessary to chill the castings a sufficient amount to permit their ejection at the proper point in the cycle of the casting machine.

During each cycle, the mold is first carried through a chamber in which soot from acetylene flames is deposited in cavities and on the mold parting. Although some of this soot adheres to the castings, some builds up on cavity walls and on the parting faces, which usually are flat. The coating also gradually becomes rougher and, after about 5000 pours,

Fig. 1—Back face of metal mold (left) showing integrally cast cooling pins. Parting face of three-cavity mold at right has sand core in place

Fig. 2—Cupola charging bucket is moved on car to assemble charge from pig iron, scrap and coke bins

Fig. 3—Transferring charging bucket to cupola

Fig. 4—Electric holding furnace into which cupola metal is tapped before transfer to bull ladle

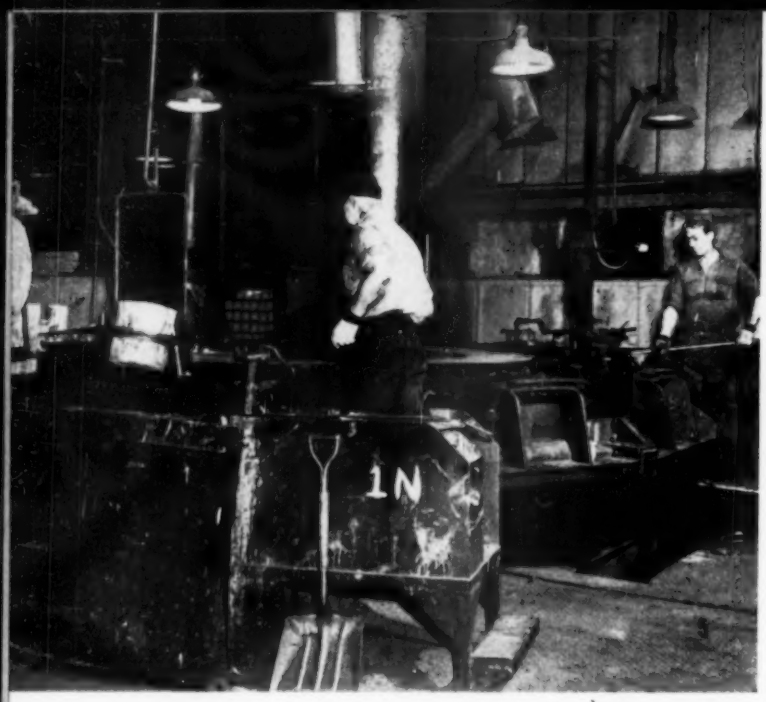


Fig. 5—One of the casting machines. At right is knockout station where castings are discharged onto conveyor. Man in background places cores in molds

the molds must be removed from the machine and cleaned.

Cleaning is done by sand blasting. This also removes the refractory coating of chalk, which has to be replaced by spraying on a new coat and smoothed with steel wool before the mold is reused. After about 25,000 cycles total or four cleanings and recoatings, the molds generally are worn out and are replaced. For most parts run in this foundry, several molds are made. As the number of castings per mold during its life generally is about 25,000 times the number of cavities therein, mold cost per casting is small.

It requires, as a rule, about 10 minutes to change a mold, and the machine must be stopped during the change. Since changes are infrequent and generally can be made when the machine is idle for some other reason, delays for changing have only slight bearing on overall costs.

Each casting machine carries 12 molds on a table rotating slowly and continuously. One half of each mold is fixed and the other is on a platen that is moved pneumatically and horizontally in a radial direction to open and close the molds. Each table ro-

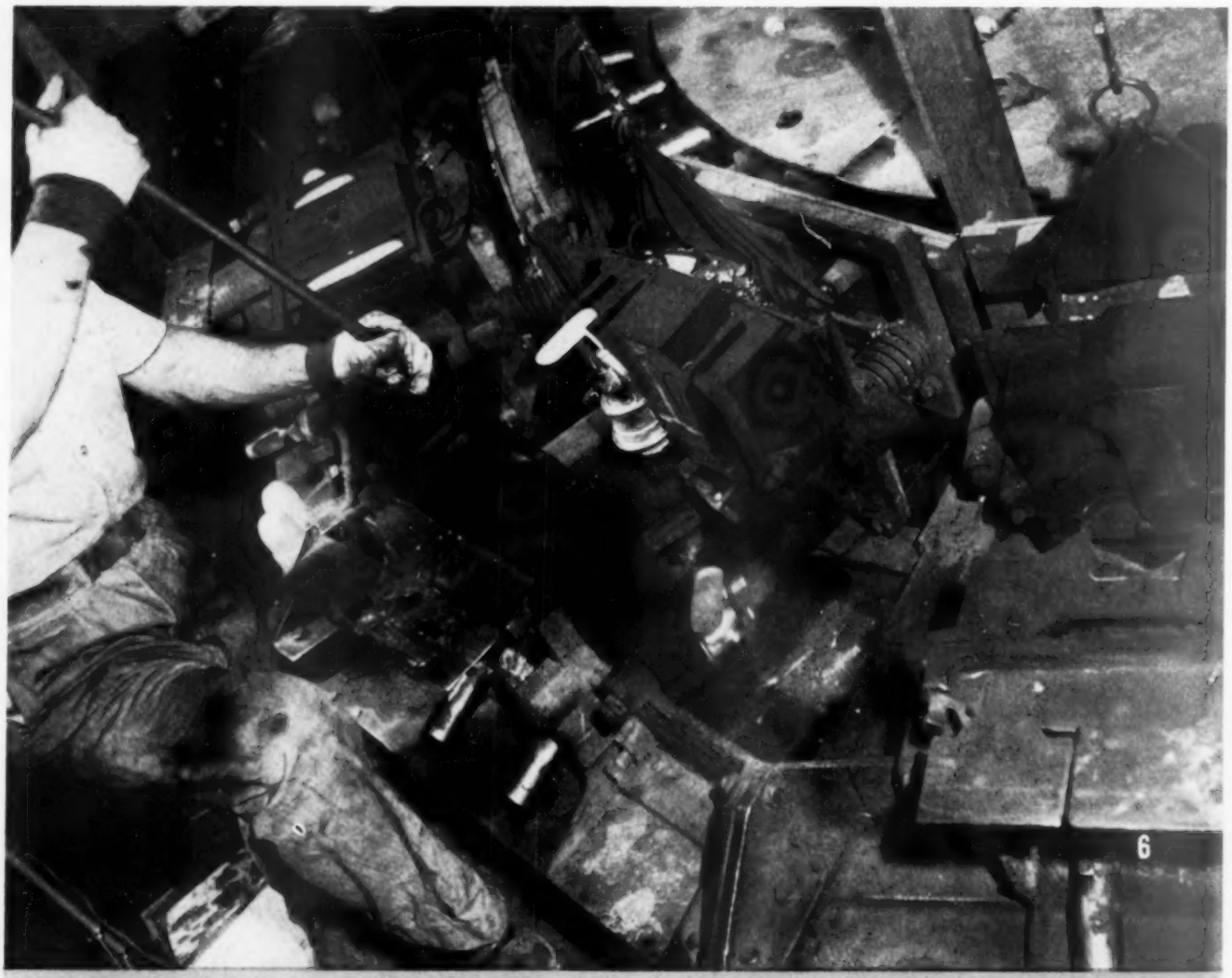
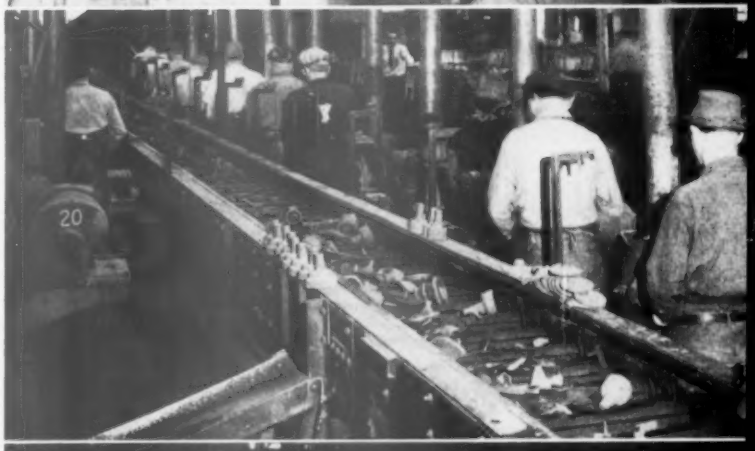


Fig. 6—Closeup at knockout station of one machine. Casting with sprue and runner still is in left cavity. Empty mold ready to enter smoke box at right

Fig. 7—Rotating drum (foreground) in which castings are heat treated. Drum in background is for cooling

Fig. 8—Cooled castings on the picking conveyor

Fig. 9—Castings are stored temporarily on this conveyor before being discharged into blast units



tation requires 120 to 200 seconds, depending on the castings being made. During each turn, each mold is advanced through a series of stations in a repetitive cycle. At the first station, each mold passes through a smoke box where acetylene flames apply a soot coating. Then the mold continues through a station where, if required, a core is set by hand in each cavity. About half of the molds used require no cores.

Cores are taken from trays in a rack convenient to the core setter. If different molds are in the machine, a tray of each of the cores needed is kept at hand. However, most castings are required in quantities sufficient to use 12 duplicate molds. This simplifies operating conditions. As each mold in a given machine at a given time goes through the same time cycle, all castings made in this cycle must cool within a certain time interval so as to be ready for ejection at the ejection station.

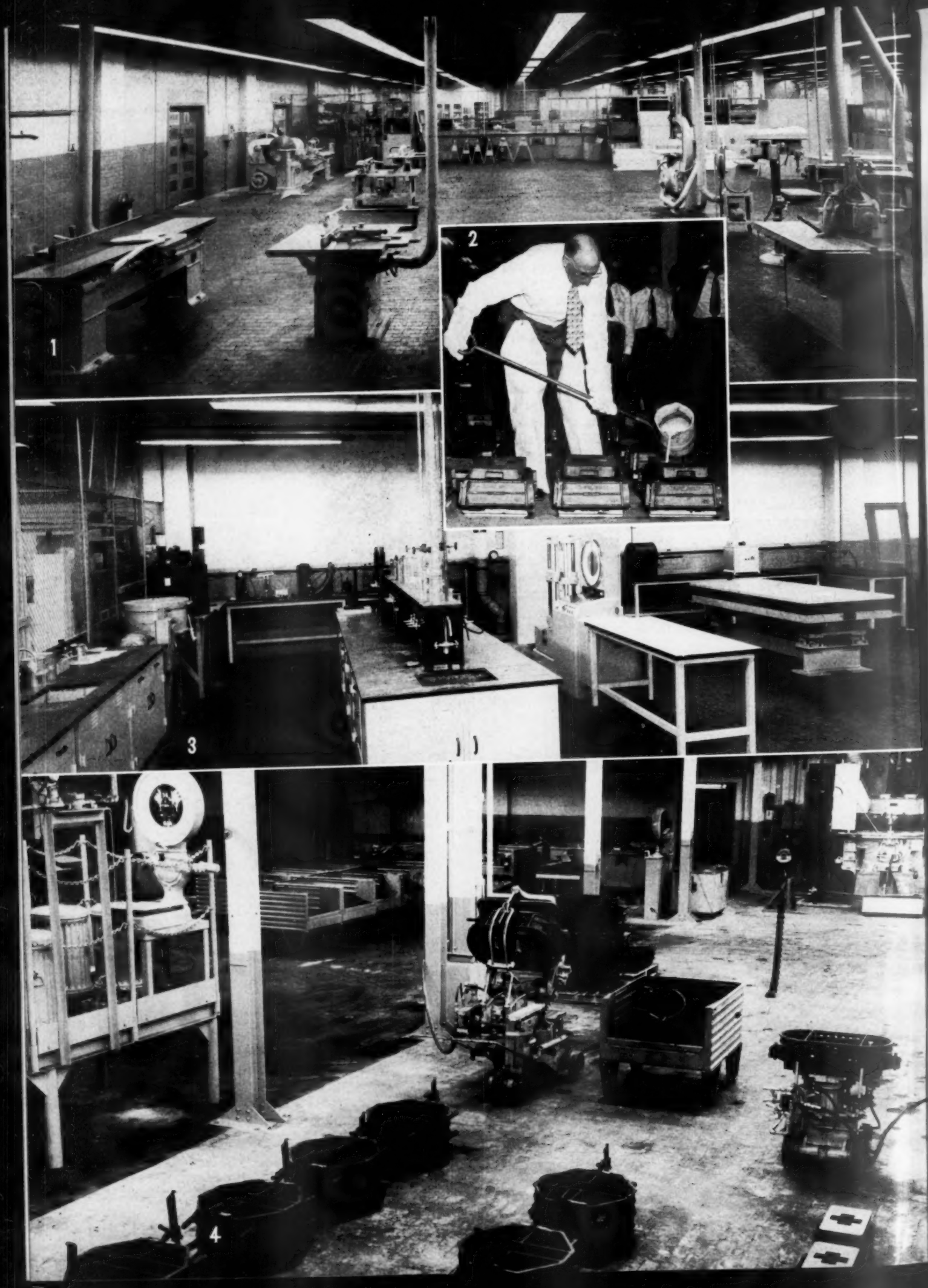
After molds pass the core setting station, they remain open until, just before they reach the pouring station, a cam actuates the air valve and an air plunger closes and locks the mold. About 4000 lb locking pressure is applied, although only gravity pressure on the metal poured tends to force the mold open.

Three cupolas are available for melting. Only two are in regular use and they are operated on alternate days. Charging is done with a bucket (Fig. 3) which is filled on weight scales (Fig. 2). The metal charge is 25 per cent ordinary pig iron, 27.5 per cent malleable pig iron, 2.5 per cent silvery pig and the remainder scrap.

Composition of the iron cast is 3.50 per cent C, 2.6 per cent Si, 0.15 per cent max S, 0.30 per cent max P, 0.50 to 0.70 per cent Mn and remainder iron.

Iron from the cupola is tapped into an electric furnace (Fig. 4) of the tilting type. This is done, not for duplexing, but to hold (*Please turn to page* 232)

Fig. 10—Clean castings are discharged onto these belt conveyors for individual inspection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International Harvester Co. Dedicates

New Research Foundry

INTERNATIONAL HARVESTER CO. dedicated the first unit of its new $1,200,000 research foundry on Aug. 15. The foundry is located in the company's manufacturing research building at 5225 South Western Blvd., Chicago. This new castings shop provides something new in the industry, a foundry manned entirely by college graduates. When the research foundry operates at the peak of its research and training program, it will employ about 65 people.

In welcoming guests at the dedication ceremonies, Fowler McCormick, chairman of the board, pointed out that while manufacturing research is the center of original and creative research of the company, it also acts as a funnel for carrying scientific and technical information to the various plants and departments within the company. Before establishing manufacturing research, a great deal of forward looking activities which could be classified as research went on in connection with the various maufacturing operations, but much of the information developed was never brought together and made available to all departments of the company. Mr. McCormick said that manufacturing research also serves as a channel through which the company gains information from the outside—both from other companies and academic institutions.

To gather information on research work which will continue in the various plants, and to interest the different departments in applying the results of work at manufacturing research, the company has set up a number of committees with membership comprised of representatives of the (*Please turn to page* 169)

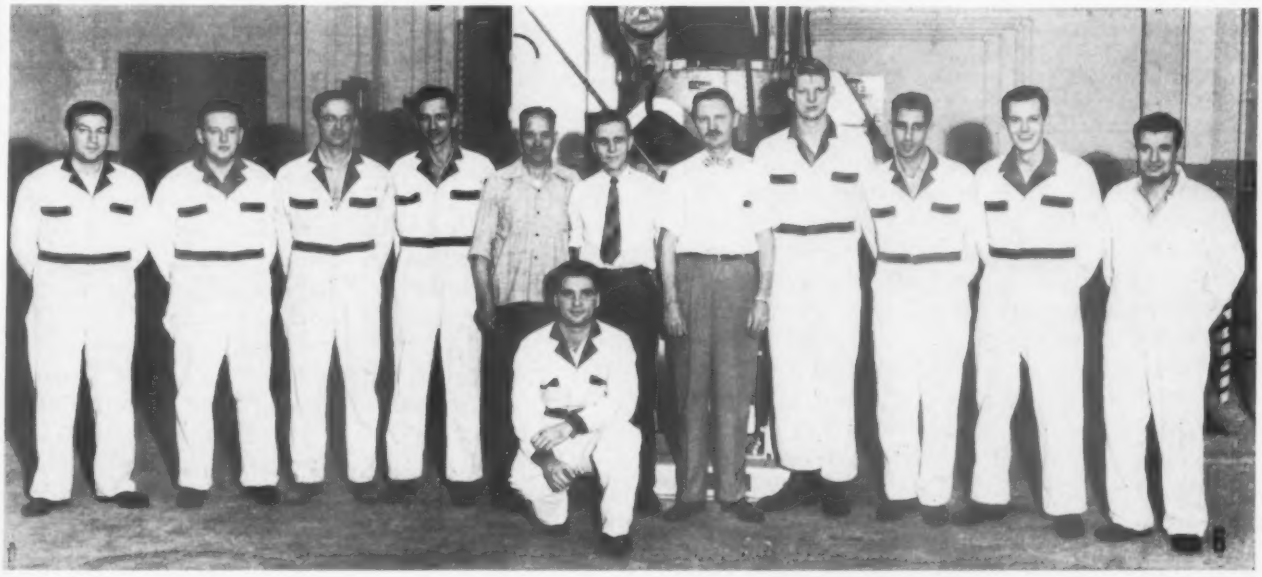


Fig. 1—Pattern shop laboratory. Fig. 2—President John L. McCaffrey pouring first ladle of hot metal at formal opening of International Harvester's new research foundry laboratory. Fig. 3—Sand laboratory. Fig. 4—Molding area. Electric furnace in right background. Fig. 5—Fowler McCormick, board chairman, speaking at dedication ceremonies. Fig. 6—Foundry laboratory personnel

QUESTIONS and A

Cast-in Tubing Cut by Metal

Q.—We are making a horseshoe-shape copper casting which is cast around a steel tube ⅜ to 7/16-in. diam and wall thickness 1/16-in. or less. Face of the casting is 3 x ¾-in., and the inside opening is 12 in. diam. We have tried seamless tubing recommended by a leading steel company, but it seemed to split in one or two places inside the casting. Tubing was filled with coarse white sand, and the copper was poured at 2300° F.

A.—It appears that your trouble with the steel tubing is not splitting, but cutting due to molten metal flowing over the affected portions for too long a period. You do not mention how the casting is gated, but the chances are that you are using possibly two gates, and the molten copper flowing through them impinges on the thin steel tube sufficiently long to destroy it at those points. Obvious remedy is to increase the number of gates so that the amount of metal flowing in does not cause any trouble.

Another method would be to coat the tube with a refractory wash where the metal impinges on it, but that would have to be done carefully so that the coating would not peel or flake off, and cause defects at some other point. A heavier tube probably would eliminate the trouble, but apparently that change cannot be made. We also suggest that you try pouring the copper at a lower temperature than 2300° F. You should obtain solid castings of ¾-in. thickness with a temperature not over 2225° F. Possibly such a reduction in pouring temperature might eliminate the cutting of the tube.

Design Foundry for Soil Pipe

Q.—We are two engineering students who have been assigned the problem of designing a foundry and the layout of the equipment necessary for the production of soil pipe castings. We shall appreciate any information that may be of assistance in this assignment.

A.—Your problem would be greatly simplified if you have access to back numbers of THE FOUNDRY either in your university library or elsewhere. Many articles have been presented on the subject of making soil pipe castings, the straight lengths and the various fittings. These articles cover floor layout, flasks, patterns, cores, molding methods, melting and distribution of metal, cleaning and dipping in finish coat material. In recent years centrifugal casting equipment has been adapted to the production of soil pipe.

For many years, and up to the present, green sand molds for soil pipe castings have been rammed by hand, or on jolt machines, or under the sand slinger. The green sand cores for the straight lengths are made on a primitive type lathe where the sand falls on to a revolving cast iron or steel arbor. Green sand cores for the fittings usually are rammed by hand in suitable coreboxes. A method for making mold and core from a single matchplate was described and illustrated in the December, 1946 issue of THE FOUNDRY.

All the foregoing factors enter into a solution of your problem. One of the most important factors, one you have not touched upon, is the approximate tonnage of castings to be produced. Obviously a plant designed and equipped for the production of 2 or 3 tons per day, would be of little use where the owner was basing his plans on a production of 40 or 50 tons.

Heavy Bronze Casting Facing

Q.—We shall appreciate any and all information regarding dry sand facing for molds to be blacked and oven dried to produce bronze castings ranging in weight from 300 to 2000 lb. Do you consider pitch a suitable binding agent?

A.—Facing sand mixtures for molds to be skin dried or oven dried may vary to a considerable extent and yet serve satisfactorily. Sands in some localities in this country are ideal for dry sand molding practice. Grain size, permeability and bond form the correct combination for a mold face after a suitable heat treatment which may be a thorough drying in an oven, or a skin drying to a depth of 1 or 2 in. In other places the sand may be lacking in permeability, too low or too high in bonding material, with grain size too fine or too coarse.

A coarse grain is preferable for dry sand. It means increased permeability and does not affect the casting face since it is covered with a smooth coating of plumbago, or other type of blacking. Sands which lack certain characteristics must be adjusted to some extent. Permeability and refractoriness are increased by the addition of silica sand, which may be from a recognized silica deposit, from wind swept dunes or from lake or ocean beaches. Bond is increased by addition of clay or any of the various artificial or proprietary bonding materials.

You do not list the characteristics of your present sand. Therefore we cannot suggest a definite formula. An ideal natural sand requiring little or no artificial manipulation will show AFS fineness between 70 and 80, a high clay content, in the shop vernacular a "strong" sand, and permeability 100 or higher. Since there is practically no difference between dry sand facing for gray iron or bronze castings, the follow-

Answers

ing formula is submitted for your consideration. The facing is used in a machine tool foundry where the molds are skin dried by a passage through an oven where the heat is deflected from a low ceiling. The molds are dried to a depth of 1½ to 3 in. in approximately three hours. Sand is prepared in a muller in batches containing 2500 lb as it comes from the shakeout, 7 qt pitch, 2½ qt bentonite, 7 qt clay, 1 qt cereal binder.

Production of Small Castings

Q.—We are interested in any books relating to the molding of nonferrous castings, particularly for small ones weighing from 0.1 to 0.2-lb each.

A.—We do not know of any book which will give you information on the best procedure for molding your small castings. It is our opinion that the most suitable method would be to squeeze-mold them. If the production runs large enough, a complete plate of the particular castings could be made, or if not, groups of patterns on removable insert plates could be made so that a number of them could be run in one flask, changing inserts as often as desired to meet production requirements.

The patterns could be placed in an adjustable frame with dividers as shown on page 172 of the July issue of THE FOUNDRY, or a special mounting frame with fixed dividers constructed for the purpose. With such a frame a permanent sprue attachment with a permanent runner could be made a part of it. Runner would be designed so that when the pattern inserts are located, the gates or branches for them would attach without difficulty.

Making Patterns for Castings

Q.—Can you give us any information on a textbook on how to make patterns for small and simple flat-back aluminum castings; also double-sided, such as house silhouettes, weathervanes, mailbox silhouettes, etc.?

A.—Most of the patternmaking textbooks are designed for students in schools and colleges, and give information on procedures for the usual industrial patterns, starting with the simplest forms, but we doubt that they will give you the information you want. The easiest and most rapid method for you would be to form your original patterns in modeling wax or clay. From these patterns plaster molds can be made, and in turn aluminum or plastic resin patterns from the molds, or single and double-face matchplates as the case may warrant.

The original or master wax or clay model, of course, should have a double shrinkage allowance—one for the aluminum pattern, and the other for the casting. Shrinkage allowance for aluminum alloys may vary from 5/32 to 1/10-in. depending upon whether cores and other projections, etc., tend to prevent normal contraction, but in your case with comparatively simple castings, about ⅛-in. should suffice for each. However, to determine the exact shrinkage allowance, it will be necessary to make a model, say 5/32-in. larger in its dimensions. Make the plaster mold, then the pattern, and determine its dimensional contraction. Adjustments then can be made on the original model to bring it to the desired size.

Ring Cracks Around Spider

Q.—Please supply a formula for a bronze worm gear blank. The bronze ring is to be cast around an iron spider 12 in. in diameter, 2½ in. face provided with bronze rims, and 1¼ in. thick. We have cast several, but they all cracked on account of the excessive shrinkage or contraction.

A.—When casting bronze veneered cast iron gear blanks, it is customary and in fact mandatory to heat the cast iron center to expand it before it is placed in the mold. This is necessary to insure that the bronze ring and the iron spider will contract uniformly. In several shops gear blanks of this type, cast iron center and bronze ring, are made without any trouble. Bronzes for gears include the well known 88 per cent Cu, 10 per cent Sn and 2 per cent Zn alloy and its several modifications such as 88 per cent Cu, 8 per cent Sn and 4 per cent Zn; 88.75

GANGWAY! By J. A. PATTERSON

"Yeah, but you gotta be terrifically fast to do it!!"

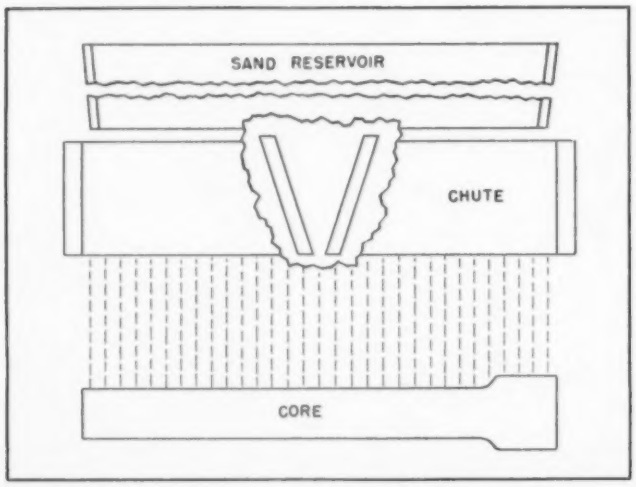
per cent Cu, 11 per cent Sn and 0.25 per cent Pb; 87 per cent Cu, 10 per cent Sn, 1 per cent Pb and 2 per cent Zn.

Sweep Cores on Steel Barrels

Q.—In our present practice, molds for straight lengths of soil pipe castings are green sand. Coir (coconut fiber) string is wound around the core barrel and then a coating of loam is applied. Cores are dried in an oven. Small vent holes are drilled about 2 in. apart all over the barrel. We have attempted to use green sand, but without success. The unwashed silica sand is bonded with 6 per cent bentonite, also small amounts of coal dust and iron oxide. This sand shows a permeability of 90, grain size 90, green strength 7.5 psi, and moisture 5.5 per cent. The arbors are dipped in a bentonite wash and placed on a stand with a straight edge ½-in. away to impart the proper size and shape. Sand is applied by hand but it does not adhere uniformly. In an article on the subject of soil pipe molding practice presented in the June, 1946 issue of THE FOUNDRY the statement is made: "The core barrels for the straight lengths are seamless steel tubes, subjected to a water spray, placed in a coremaking device and green sand cascaded on to the surface while the barrel is revolving." Can you tell us (a) whether the arbors have ribs welded on to hold the sand, or (b) Are the arbors provided with vent holes?

A.—Green sand molds for the standard 5 ft, 6 in. soil pipe castings may be rammed by hand or by any of several types of mechanical equipment including the special machine described in the article to which you refer. Another article published several years ago described a prominent southern foundry in which a sandslinger was employed. The most recent development, centrifugal casting, in which no cores are needed was described in the May, 1950 issue of THE FOUNDRY.

Irrespective of the method employed for ramming the molds, all green sand cores are made according to a method which may be regarded as standard.



Sand from an overhead hopper falls through an oscillating chute on to the core barrel

The most essential item in this method is the device for applying the sand to the core barrel. This is an oscillating container with a screen in the bottom mounted above a tapered chute through which the sand falls in a thin stream on the revolving arbor. Height of the narrow slit in the chute may vary from 3 to 4 ft depending on the sand characteristics. A little experimenting readily can determine the proper height for any given installation.

Sand may be conveyed to the upper box by hand, or by a bucket type hoist. The box may be shaken by hand, by a small motor, or by belt from a convenient jackshaft. A clutch arrangement controlled by a pendent handle, a foot pedal starts and stops the oscillating box. It is not necessary to claywash the arbors. They may be sprayed with water from a hose or dipped in a water tank. Iron oxide may be omitted from the sand mixture. Use of this material is justified in certain instances where increased resistance to heat is necessary, but that condition is not present in the comparatively light soil pipe castings.

Replying to your concluding questions (a) The barrels are plain, no ribs or any other projections. (b) The arbors are pierced with small vent holes as in your present arbors.

Constructing Hard Sand Match

Q.—We have had considerable trouble making a sand match hard enough for permanent use. The frames are 12 x 16-in. and 1½ to 3-in. high filled with a mixture of fine floor sweepings, boiled linseed oil and litharge. We shall appreciate advice on the correct proportion of these ingredients.

A.—We are afraid you are too optimistic if you expect to construct a permanent hard sand match. A well made sand match will last for a considerable time if it is not abused or knocked around by careless workmen, but eventually any sharp corners or irregular parting line will wear away to an extent that destroys its usefulness. There is no such thing as a permanent match, and a sand match is regarded as the one with the shortest life expectancy among the available materials employed in the foundry for the purpose of supporting patterns and forming the parting plane between cope and drag parts of the mold.

Nearly every foundry where hard sand matches are employed has a pet formula for the mixture and excellent proprietary materials called pattern compounds are available on the market. Some foundrymen favor all new molding sand. Others add varying amounts of sharp ranging from 10 to 50 per cent. Others again make the matches from the refuse under the tumbling barrels, or from spent sandblast sand. Matches that are dried in the oven are made from regular core sand mixtures in which the sand is bonded with any of the usual core binders. Naturally, in this type, the frame is metal instead of wood.

Where a substantial follow board or sand match is required—not a permanent match, but one that will stand up in repeated use over a comparatively long period—the new sand is mixed with linseed oil and a small amount of litharge, say a small hand full, or

(*Concluded on page* 120)

A 1950 CAR WITHOUT A STARTER WOULD BE LIKE A 1950 FOUNDRY *without...*

Thousands of foundrymen say, "We couldn't do without Royer"

BETTER CASTINGS requiring less machining and polishing are obtained when sand is separated and blended by Royers . . . with fewer rejects due to skids, runouts and surface inclusions.

BETTER EMPLOYEE RELATIONS in a cleaner, less crowded plant.

BETTER PRICE to customer, thanks to lower labor costs, sand economies and fewer rejections . . .

which add up to

Happy Customers
Happy Stockholders

Any foundry still blending and riddling by hand is tolerating a horse-and-buggy operation . . . and is in no position to compete with plants using ROYER SAND SEPARATOR & BLENDERS.

Royer machines eliminate all hand labor except shovelling into the hopper. They automatically perform six vital sand conditioning operations:

1. Comb and blend old sand, new sand and bond
2. Break up all lumps and clay balls
3. Distribute moisture evenly
4. Reject burnt cores, trash, foreign objects
5. Double aerate sand, cooling and degassing it
6. Increase permeability 10 to 20 points

More than 7500 Royers now in service. Many have seen 10 to 15 years daily use and are still doing a grand job. Write today for Bulletin 744—it gives full specifications for all Royer models.

FOUNDRY EQUIPMENT MANUFACTURERS' ASSOCIATION, INC.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
159 PRINGLE ST., KINGSTON, PA.

QUESTIONS and Answers

(*Concluded from page* 118)

about half the amount that can be lifted on a trowel, to a shovelful of sand. The sand is dried and then mixed with linseed or other core oil in the proportion of 1 part oil to 25 parts sand. Sufficient water is added to render the mass workable. The match will dry hard in about 24 hours when it may or may not be given a light finishing touch of shellac.

In some foundries fire clay is employed instead of sand. Other available materials more substantial than sand for matches or follow boards, include plaster, gypsum, and several proprietary materials.

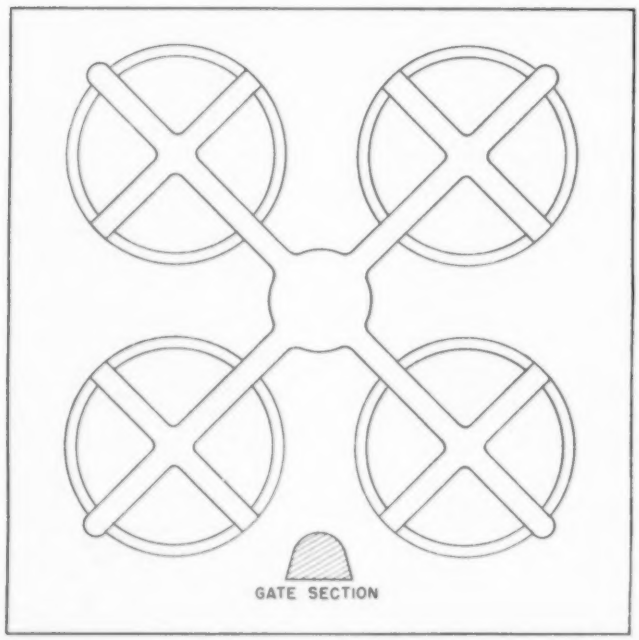
Molding and Pouring Are Faulty

Q.—We are trying to produce a plumbing casting called a ferrule which is 4⅜ in. in diam, 4⅜ in. high and about ⅛-in. wall thickness, and are having considerable trouble in securing sound castings. We use a flat back plate with six shell patterns mounted on it which leave their own cores. Flasks are 14 x 18 in. with 5-in. cope and 5-in. drag. Molds are made on a squeeze machine without jolting. Castings are gated individually using a central sprue with three flat branches (¾ x ¼-in.) feeding into the top rim or flange of the casting. We have tried Albany sands ranging from No. 1 to 2½, four castings instead of six, etc., with not much improvement. Metal is poured at 2300°F according to an immersion pyrometer. Alloy is 85-5-5-5. Slightly better results were obtained with yellow brass containing 4 oz of aluminum per 100 lb. Trouble seems to be a matter of trapped gas, and yet with well vented cavities we obtain poorer yields. We pour six molds at a time since they take the contents of a No. 70 crucible, and out of the 36 castings, our average is 5 or less.

A.—From your description we suspect that the main cause is your method of molding. Thin-section castings of this type are somewhat difficult to make in the first place, due to the rapid solidification which occurs; hence, metal temperature, method of gating, sand condition, etc., must be considered carefully. In our opinion your procedure of pouring the castings individually is one source of trouble. The casting cavities are located rather close together—2 in. and 1⅛ in., and when one casting is poured, the steam and other mold gases tend to travel through the sand into the adjacent cavities. In that passage, the steam at the pouring of the first few castings is condensed to water on or close to the walls of those cavities to cause trouble from wet sand. As pouring the individual casting progresses the steam and mold gases probably just enter the other cavities as such and cause disturbance of the molten metal as poured in.

Therefore our first suggestion is to arrange the castings so that they are poured simultaneously. Since they are of thin section, we do not believe it will be feasible to pour more than four at a time. As shown in the accompanying sketch, the four castings can be made in a 14 x 14-in. flask, spaced 1¾ in. from the walls and each other. The gating system is all in the cope, and we believe that the cope should be as shallow as possible to minimize heat loss of the metal. Use of a deep cope to provide a long sprue for feeding purposes is of little value since the thin-section wall of the casting freezes too fast to permit much, if any, feeding.

Also to keep the heat loss low in the gating system, we believe that the branch runners should be kept as compact as possible. Hence, to that end it is recommended that the cross section of the runners and gates be designed as shown in the accompanying illustration—a modification of a ½-in. square section to eliminate the sharp corners at the top. Possibly the section of the runner might be reduced, but that would have to be determined by experiment. Sprue area should be somewhat larger than that of the total of the runners so we suggest one of 1¼ in. diam. We also believe it will be advisable to extend the main branch runner to each cavity a short distance beyond the edge as indicated. The pockets thus formed will act as dirt catchers for the first surge of metal.

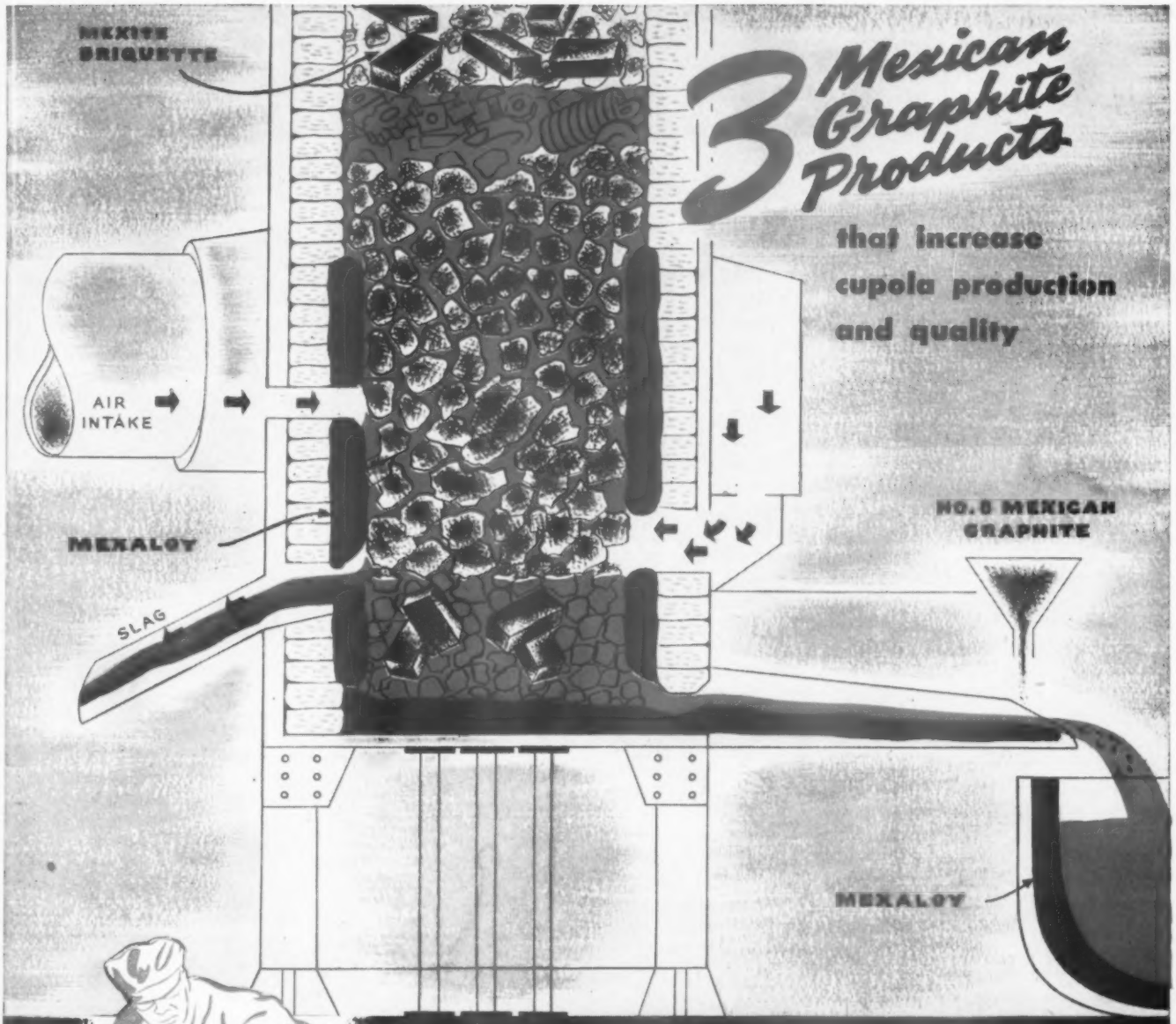


Suggested method for top gating four ferrule castings feeding from a central sprue

No Special Precautions Needed

Q.—We have purchased a small quantity of silvery pig iron for use in our cupola, and we would like to know if there are any special precautions to be followed in using it, such as size of lumps in charge, allowance for losses, etc.

A.—With good cupola practice, there are no special precautions required in usage of silvery pig iron. Breakage into very small lumps is neither necessary nor desirable. Use as large lumps as may be required to give the desired silicon addition. These should be thrown onto the center of the charge, well away from the cupola walls. Usual practice is to charge last along with pig iron and return scrap. When calculating silicon in the mixture (including silvery), make usual overall allowance for loss, neither adding nor deducting any special loss due to usage of silvery.



3 Mexican Graphite Products

that increase cupola production and quality

MEXITE BRIQUETTES. One 4-lb. Mexite Briquette provides the same carbon content as 50 lbs. of pig iron when introduced into the cupola charge. Not only do Mexite briquettes sharply reduce melting costs per ton; they also reduce the range of carbon content fluctuation and give a steadier carbon analysis, a particularly vital factor when high percentages of steel are charged.

MEXALOY, applied to cupola linings, ladles, and spouts, resists molten metal and slag and keeps metal free from refractory inclusions. Its natural lubricating action provides low friction surfaces which part easily from metal and slag. A Mexaloy mixture is easily applied to any clean surface. Because it will not melt or change character under intense heat, Mexaloy gives longer refractory life with lower maintenance cost.

NO. 8 MEXICAN GRAPHITE is used for ladle additions to treat grey cast iron. Trickled into the cupola spout as metal falls into the ladle or with a direct ladle addition, it greatly reduces chill and hardness, producing castings of increased machineability. Normally only 2 lbs. of No. 8 need be added per ton of molten metal—a cost of only ten cents per ton—to assure castings which require no annealing. Write today for complete information on how Mexite Briquettes, Mexaloy, and No. 8 Mexican Graphite will give you better castings for less money.

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN

DIVISION OF THE WICKES CORPORATION

MEN of Industry

E. CLAUDE JETER has been named manager of the new production foundry under construction in Cleveland, by Ford Motor Co., Dearborn, Mich. **Harry G. McMurry** succeeds Mr. Jeter as manager of the Dearborn Iron Foundry, known formerly as the Rouge Production Foundry. Mr. Jeter joined the company following graduation from Clemson College in 1928, and worked in the analytical laboratory of the metallurgical control department. The following year he was transferred to the experimental department where he specialized in casting processes and techniques. In 1944 he became a staff member of the foundry's metallurgical control department and in 1947 was appointed assistant superintendent of the Rouge Production Foundry. Early this year he became manager of the production foundry and supervisor of the pattern shop. Mr. McMurry studied mechanical engineering at Lambuth College, Jackson, Tenn., and was associated with Buick Motor Division, Flint, Mich., from 1927 to 1945, where he worked in various departments of the foundry. From 1946 to 1949 he was engaged in setting up a modern automotive production gray iron foundry in Melbourne, Australia, for GMC. Returning to the United States last year he became assistant plant superintendent, Pontiac Motor Division, Pontiac, Mich. In March, 1950 he joined Ford as assistant manager of the Rouge Production Foundry. Mr. McMurry was chairman of Saginaw Valley Chapter, AFS, in 1945.

Warner B. Bishop has been named manager of foundry sales, Archer-Daniels-Midland Co. (Werner G. Smith Co. Division), succeeding **L. P. Robinson,** who recently was elected vice president. Mr. Bishop received his master's degree from Dartmouth College, following his graduation there, and spent 3½ years with the U. S. Naval Reserve during World War II. He joined the foundry division of Archer-Daniels-Midland Co. in 1945, organized and supervised its export activities and was appointed assistant to the sales manager in 1948. Mr. Bishop has served on the National Exhibits Committee of the AFS and on the Supplier's Committee of the Foundry Educational Foundation. **Robert V. Hunter,** sales representative for the Werner G. Smith Co. Division, has been appointed eastern sales manager of foundry products. An alumnus of Cornell University, Mr. Hunter joined the company 11 years ago, and has specialized in the sale of drying oils to the paint industry, as well as foundry core oils. **John L. Meckel,** who has spent the past 18 months in a training course at the company's foundry research laboratory, has been appointed sales representative in Minnesota, to handle sales of the company's core oils.

♦ ♦ ♦

Robert I. Moore, formerly associated with Wilson Brass & Aluminum Foundry Co., Toronto, Ont., has joined the engineering division of the Southern California Gas Co., Los Angeles. Following service in the Royal Canadian Air Force during World War II, Mr. Moore studied mechanical engineering at University of Toronto. At the 1950 Cleveland Convention of the AFS he presented a paper entitled "Metal Melting—Application of Thermodynamic Principles to Melting Nonferrous Metals."

♦ ♦ ♦

Fred M. Gillies, executive vice president, Acme Steel Co., Chicago, has been named a director of Whiting Corp., Harvey, Ill., to fill the vacancy caused by the recent death of Gen. Thomas S. Hammond. Mr. Gillies was works manager for Inland Steel Co., Chicago, until he joined Acme Steel Co., a few months ago.

♦ ♦ ♦

George Shutzbaugh, for the last 3 years manager, Southern Illinois Foundry Co., Carmi, Ill., has been transferred to the Chicago office of the company. Mr. Shutzbaugh will be associated in Chicago with Northwestern Stove Repair Co., for which Southern Illinois Foundry Co. produces stove pots, furnace pots and related castings. **Hershel Schwab** succeeds Mr. Shutzbaugh as manager in Carmi, Ill.

♦ ♦ ♦

Thomas J. Wood has been appointed chief metallurgist of the Brake Shoe & Castings Division, American Brake Shoe Co., New York. Mr. Wood joined the company in 1939 as assistant metallurgist and was as-

(*Continued on page* 124)

E. CLAUDE JETER

HARRY G. McMURRY

ROBERT V. HUNTER

WARNER B. BISHOP

WOODWARD IRON COMPANY
WOODWARD, ALABAMA
General Sales Offices
1515 First National Building • Birmingham, Alabama • Phone 54-1667

MEN of Industry

(*Continued from page* 122)

sistant superintendent, superintendent and eastern district works manager in the division's operating department. **Raymond A. Frick** succeeds Mr. Wood as eastern district works manager. **Ralph C. White** has been appointed superintendent of the north Kansas City plant. **Raymond A. Martinson** has been named superintendent of the Chicago plant of the Brake Shoe & Castings Division.

♦ ♦ ♦

John Taylor, formerly vice president and foundry division manager, Norris & Elliott Inc., Columbus, O., has been appointed vice president in charge of the Industrial Engineering Division, Lester B. Knight & Associates Inc., Chicago and New York. Mr. Taylor, who has been in the industrial engineering field for 27 years, spent the last 14 years as a foundry engineer, specializing in analyzing and improving methods, installing and revising incentives, production control and scheduling, etc. He originated and developed a simplified standard cost system for foundries and is familiar with all types and sizes of foundry operations.

♦ ♦ ♦

Howard H. Wilder has been appointed manager, Iron Foundry Division, Vanadium Corp. of America, with headquarters in Detroit, succeeding the late R. G. McElwee. For the last 4 years Mr. Wilder was chief metallurgist of Eaton Mfg. Co.'s Foundry Division at Vassar, Mich. Prior to that he was research metallurgist, Wilson Foundry & Machine Co., Pontiac, Mich.; foundry service engineer, Vanadium Corp., Detroit; metallurgist, Detroit Stoker Co., Monroe, Mich., and was also associated with the Chevrolet Gray Iron Division, General Motors Corp., Saginaw, Mich. During the war he served with the Gray Iron Foundry Section, War Production Board, Washington. While residing in Vassar, Mich., Mr. Wilder was an active member of the Saginaw Valley Chapter of the AFS, and had been named its chairman for the current year. He is a former secretary of the Detroit Chapter of that society.

♦ ♦ ♦

John A. Decker, formerly assistant sales manager, has been appointed sales manager for the New York district of the Carborundum Co., Niagara Falls, N. Y. Mr. Decker has been associated with the company since 1933. **William J. Kingsley** has been named assistant sales manager of the Bonded Products and Grain Division, with headquarters in Niagara Falls, N. Y. Mr. Kingsley, who joined the company 28 years ago, was formerly a salesman working out of Syracuse, N. Y., and Boston. **Thomas Curtiss,** until recently a field sales representative in the Buffalo district, has been transferred to the central New York area. **Edgar T. Harris** succeeds Mr. Curtiss in the Buffalo district office, and **George Dennison** has been appointed a special sales engineering representative for New York state, with headquarters in Buffalo.

♦ ♦ ♦

R. P. Campbell has been put in charge of the Grand Rapids, Mich., sales office, recently opened by Wheelco Instruments Co., Chicago. The new office will cover the state of Michigan exclusive of Detroit. **Don C. Walley,** formerly sales engineer in the Chicago western division, has been appointed district manager in St. Louis. **Warren F. Paetz** has been assigned to Mr. Walley's former territory in central Illinois and Iowa. **Samuel M. McDevitt** has been transferred to the New York eastern division office and **Edward F. O'Brien** has replaced him in Philadelphia. **Tom Mitchell** has been transferred from New York to the Boston district office.

♦ ♦ ♦

Hamilton Merrill has been elected president, Manning, Maxwell & Moore Inc., New York, succeeding the late Robert R. Wason. Mr. Merrill, who was graduated from Massachusetts Institute of Technology, has been associated with the company for 30 years, a vice president since 1937 and a director for the past year. He was recently appointed vice president in charge of the Consolidated-Ashcroft-Hancock Division.

♦ ♦ ♦

Robert P. Whitmer has resigned as vice president, American Foundry & Furnace Co., Bloomington, Ill., and has sold his interest in the company to **Horace A. Soper,** principal owner. Mr. Whitmer, a graduate of Illinois Wesleyan University, had been associated with the foundry company for 28 years.

♦ ♦ ♦

Jack C. Schubert has been appointed engineer in the carbon-graphite products department, United States Graphite Co., with headquarters in the home offices of the company in Saginaw, Mich. Mr. Schubert joined the company at the beginning of this year following graduation from Michigan State College with a degree in mechanical engineering.

♦ ♦ ♦

Carl E. Allen has been named president and a director of Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. Mr. Allen, since 1940 a vice president of National City

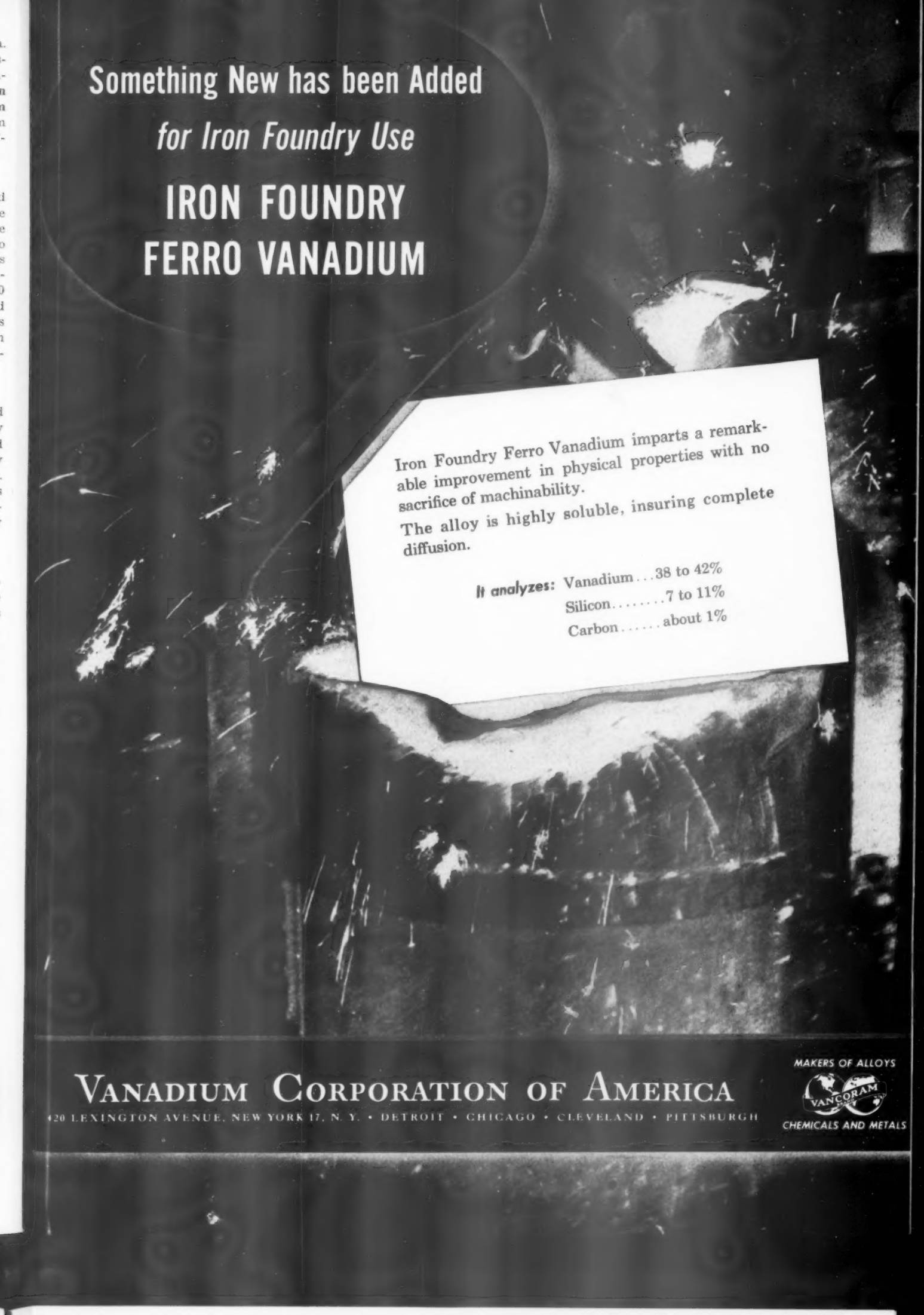
(*Continued on page* 127)

JOHN TAYLOR

HOWARD H. WILDER

WILLIAM J. KINGSLEY

JOHN A. DECKER


Something New has been Added
for Iron Foundry Use
IRON FOUNDRY
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Iron Foundry Ferro Vanadium imparts a remarkable improvement in physical properties with no sacrifice of machinability.
The alloy is highly soluble, insuring complete diffusion.
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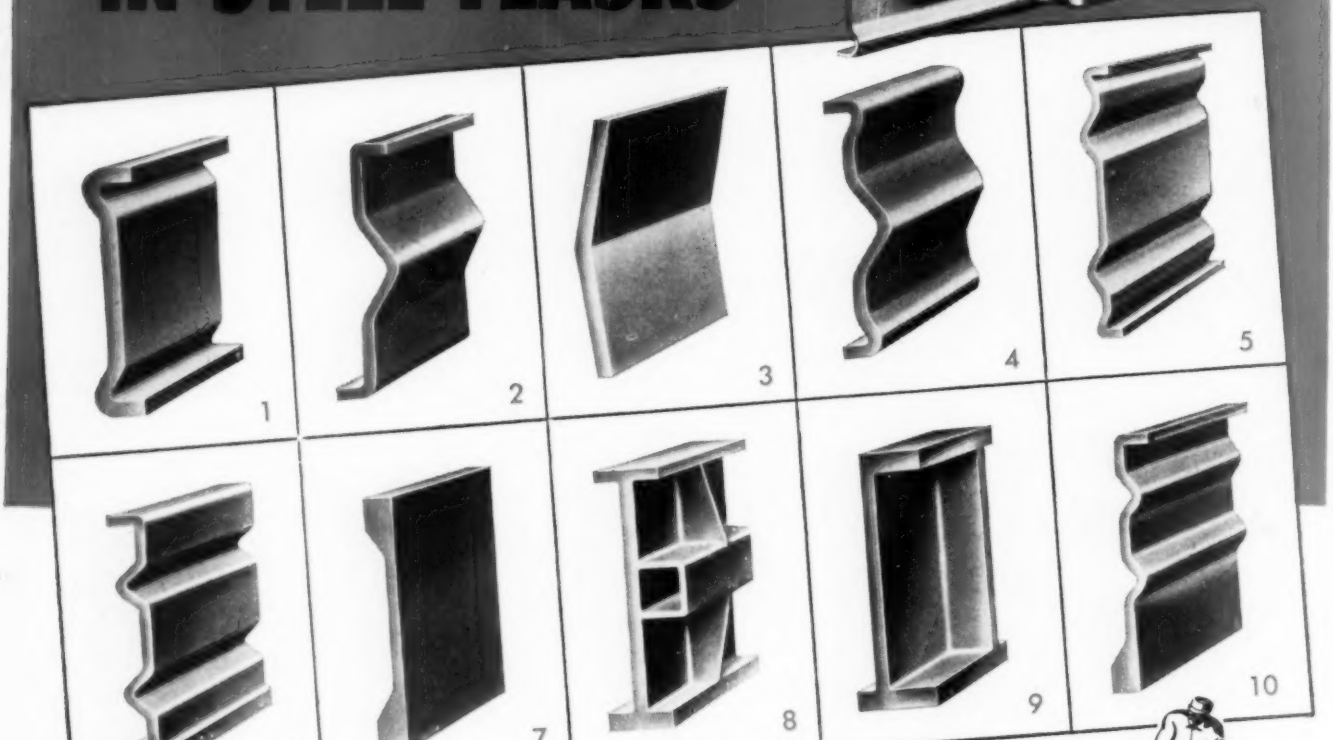

Shanafelt Flasks are built to fit your casting job and your flask handling conditions. Construction is not limited to any one particular formation — sidewalls, reinforcements, and sandstrips are designed to fit your own requirements.

The illustrations above show the versatility of the special Shanafelt formation — also different styles of sidewall and sandstrip construction which were engineered here to meet special conditions of molding and handling.

The new Shanafelt factory building was planned for making Flasks. All departments are arranged and equipped for most efficient production of steel Flasks in any size, shape and style.

Just tell us your Flask requirements and we'll promptly offer estimates on the correct Flask for your job.

The SHANAFELT Manufacturing Co.

Established 1893

2600-2700 WINFIELD WAY N. E. . . . CANTON, OHIO

SEALTYTE Chaplets and hardened steel Flask Pins and Bushings . . . shipped promptly from large stocks

MEN of Industry

(*Continued from page* 124)

Bank of New York, succeeds **Ira A. Wyant** who will continue as a director. Mr. Wyant, with Donald J. Campbell and George W. Cannon, established a small foundry in Chicago in 1905. Three years later the Campbell, Wyant & Cannon Foundry Co. was opened in Muskegon, with Mr. Wyant as vice president. He became president in 1947.

♦ ♦ ♦

Allen J. Reid, district sales manager of the Indianapolis office, General Refractories Co., Philadelphia, has been named chairman of the Central Indiana Chapter of the AFS, for the year 1950-51. Mr. Reid, a native of McAlester, Okla., was graduated from Missouri School of Mines and Metallurgy in 1931, with a degree in ceramic engineering. Following several years in the construction industry, he joined the research department of the Olive Hill, Ky., works of General Refractories Co. in 1936. Later that year he was transferred to the sales department of the Milwaukee office and in 1945 became district sales manager in Indianapolis.

♦ ♦ ♦

A. A. Hochrein, district manager, Federated Metals Division, American Smelting & Refining Co., Baltimore, is the newly elected chairman of Chesapeake Chapter of the AFS to serve during the coming year. Mr. Hochrein joined American Smelting at its Baltimore plant in 1923. For a time he was metallurgical bookkeeper and later traveling representative throughout the east purchasing secondary metals for the company's smelting and refining plants. When Federated Metals was purchased by American Smelting & Refining Co. in 1932, he was appointed manager of the new division's Baltimore office. Since the Chesapeake Chapter was organized in 1940, Mr. Hochrein has been an active participant on chapter committees, has served on its board of directors and was vice chairman last year.

♦ ♦ ♦

Howard B. Myers has joined S. H. Bell Co., Pittsburgh, as metallurgical engineer to sell ferroalloys and pig iron produced by Tennessee Products & Chemical Corp. Mr. Myers has served on the production staff of Rustless Iron & Steel Corp., Baltimore; as metallurgist with McConway & Torley Corp., Pittsburgh; research fellow, Mellon Institute, Pittsburgh; and prior to his present position was technical director for the Roll Manufacturers Institute.

♦ ♦ ♦

Lt. Col. Frank H. Holmes has been assigned to the office of the Senior United States Representative to the North Atlantic Military Production and Supply Board, with headquarters in London. The function of that board is to review the North Atlantic Treaty Organization military supply situation and make recommendations on ways and means of increasing available supplies from all North Atlantic Treaty countries. The board also promotes more efficient methods of production of military equipment and the formulation of long range plans for the standardization of production methods. For the past several years Col. Holmes has been assigned to the Munitions Board of the Department of Defense as liaison officer to a number of industry committees, including the Foundry Industry Advisory Committee and its eleven subcommittees. **Col. Earl D. Payne** succeeds Col. Holmes as committee liaison.

♦ ♦ ♦

D. J. Richards, vice president of sales, E. F. Houghton & Co., Philadelphia, has been placed in charge of all domestic and foreign sales activities, succeeding the late G. W. Pressell, formerly vice president and director of sales. Mr. Richards will also direct advertising and the product development and sales development departments. **John F. Maisch** has been appointed controller.

♦ ♦ ♦

Chester M. Adams has been appointed vice president in charge of production and research, Crobalt Inc., Ann Arbor, Mich., producer of cutting tools and cast alloys for metalworking. Mr. Adams was foundry superintendent, Haynes Stellite Co., Kokomo, Ind., for 14 years and also served as general manager, Lescalloy Division, Latrobe Electric Steel Co., Latrobe, Pa.

♦ ♦ ♦

Dr. Roman Smoluchowski has been named professor of metallurgical engineering, Carnegie Institute of Technology. Dr. Smoluchowski, who was educated at University of Warsaw, Poland, and University of Groningen, Holland, joined the faculty at Carnegie Institute in 1946 and is a member of the staff of the Metals Research Laboratory. He was formerly a research physicist with the Research Laboratory, General Electric Co., Schenectady, N. Y.

♦ ♦ ♦

Richard M. Friddle has been appointed sales representative in the Cleveland district of Allis-Chalmers, Milwaukee. Mr. Friddle joined the company two years ago following graduation from University of Colorado. **Richard A. Frazee** has been named sales representative in the St. Louis district. Mr. Frazee was graduated from University of Oklahoma

ALLEN J. REID

A. A. HOCHREIN

HOWARD B. MYERS

LT. COL. FRANK H. HOLMES

MEN of Industry

in 1948 and became associated with the company at that time.

♦ ♦ ♦

George A. Pope has been named business manager, THE FOUNDRY, with headquarters in the Cleveland office. **A. W. Johansen** succeeds Mr. Pope as Chicago district manager, and **Robert Z. Chew Jr.** has been appointed advertising representative in the Chicago district office. Mr. Pope, who joined the staff of THE FOUNDRY in 1930, has been Chicago manager since 1940. Mr. Johansen joined the sales staff in 1948, following sales experience in the Chicago office of Carpenter Steel Co., Reading, Pa. Mr. Chew has been on the advertising staff of *Hotel Monthly*, Chicago, for the past 3 years.

♦ ♦ ♦

Alan J. Bronold has been appointed sales manager, Sterling Electric Motors Inc., Los Angeles, succeeding **Allen Adams,** who due to illness has retired from active sales management but will continue as secretary-treasurer of the company. Mr. Bronold was graduated from Northwestern University with a degree in electrical engineering. He has been associated with Westinghouse Electric Corp. since 1926, and until recently was assistant general sales manager in charge of national sales for its Sturtevant Division, with headquarters in Boston.

♦ ♦ ♦

L. O. Hofstetter has been named president, Brumley-Donaldson Co., Los Angeles. Mr. Hofstetter was graduated from Monmouth College, Monmouth, Ill., and did graduate work in metallurgy while working in the die casting industry in Chicago. He went to California in 1926 and for the following 12 years was engaged in various industries including petroleum refining, sewage disposal, hard metals, refractories and foundry metallurgy. He joined Brumley-Donaldson Co. in 1938, where he served as foundry engineer and more recently as secretary and general manager. Mr. Hofstetter is a charter member of the Southern California Chapter of the AFS and served as secretary, treasurer, vice president, and president in 1948-49.

♦ ♦ ♦

Philip Johnston has been appointed sales manager, Riehle Testing Machines Division, American Machine & Metals Inc., with headquarters at the company's factory and general sales offices in East Moline, Ill. Mr. Johnston, who succeeds T. L. Richards, is a graduate of Massachusetts Institute of Technology. Prior to World War II he represented the company in New England and, following 5 years of military service, became its representative in the New York area.

♦ ♦ ♦

James G. Goldie has returned to the Cleveland Trade School, Cleveland, as foundry instructor. Mr. Goldie established the foundry department of the Cleveland Trade School in 1929. For the past 4 years he has been general superintendent, M.B.M. Foundry, Cleveland. Active in the American Foundrymen's Society, he served as chairman of its Apprentice Training Committee, and is a past president of its Northeastern Ohio Chapter.

♦ ♦ ♦

Charles Plant Jr., until recently foundry superintendent, Standard Alloy Co., Cleveland, has been appointed assistant to **H. M. Smith,** company president. **Joseph L. Lessman** succeeds Mr. Plant as superintendent. In addition, **Jack Matz** has been placed in charge of quality control, with **John E. O'Malley** succeeding him in the laboratory. **Warren B. Lum** has been named sales manager and **H. M. Smith Jr.** is purchasing agent.

♦ ♦ ♦

L. C. Daniels, until recently chief engineer, Towmotor Co., Cleveland, has been named vice president in charge of the Material Handling Division, the Buda Co., Harvey, Ill. Previous connections include the White Motor Co. and Cleveland Tractor Co., of Cleveland, and Twin Coach Co., Kent, O.

♦ ♦ ♦

Ivan E. Howard has been named regional supervisor in the south central territory, Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich., with headquarters in Peoria, Ill. Mr. Howard, for the past few years, has been a representative in Peoria for Hyster Co., Portland, Oreg.

♦ ♦ ♦

F. F. Roehll, formerly sales supervisor, has been appointed national sales manager, Eutectic Welding Alloys Corp., New York. Mr. Roehll, a graduate of Ohio State University, joined the company several years ago as a district engineer in California.

♦ ♦ ♦

Ernest F. Karbe recently was named sales representative and service engineer, Lester Castings Inc., Cleveland. Mr. Karbe will represent the company in New York state rendering field engineering service to users of zinc and aluminum die castings.

♦ ♦ ♦

W. E. Corr, Norfolk, Va., is no longer associated with Iron & Steel Products Inc., Chicago.

GEORGE A. POPE

ROBERT Z. CHEW Jr.

A. W. JOHANSEN

Proof of PAYLOADER Performance

6 AT Chicago Hardware Foundry Co., North Chicago, Ill.

3 AT Greenlee Bros. Tool Co., Rockford, Ill.

3 AT East Jordan Iron Works, East Jordan, Mich.

3 AT Dalton Foundries, Warsaw, Ind.

Of the hundreds of PAYLOADERS in Foundries and Metal Working plants, many represent repeat orders . . . proof that Payloaders are paying their way with performance that cuts costs, saves time and money, and speeds production. One man on a PAYLOADER does a variety of jobs faster, easier and cheaper than a crew of men. A glance at the PAYLOADER jobs below will help you determine where these versatile tractor-shovels can improve your operations.

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- Unload box cars.
- Carry sand, coke, scrap, limestone, etc., to storage.
- Transport materials to cupola.
- Transport and distribute sand to molding stations.
- Windrow sand for the cutter.
- Remove used sand from floors.
- Transport molten metal.
- Charge mullers, hoppers, tumbling barrels.
- Feed conveyors, elevators, mixers, screenerators.
- Remove cupola drops.
- Load trucks.
- Dispose of old sand, cores and other waste.
- Handle scrap and small castings.
- Clean up gangways, aisles and other areas.
- Load charge boxes.
- Load out trash, debris.
- Level dumps—dig and grade.
- Maintain private roadways.
- Handle coal, ashes, cinders.
- Do crane work—haul, push.
- Remove snow.

Get these helpful Job Studies that show and describe many actual PAYLOADER operations in a Foundry and in a Metal Working plant. There is no obligation. Simply write The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

SAY "HUFF"

HOUGH PAYLOADER®

Manufactured by THE FRANK G. HOUGH CO.

A Businessman Looks at His Trade Association

By HERMANN P. GOOD
Superintendent
Textile Machine Works, Reading, Pa.
and *President*
Gray Iron Founders' Society

I BELONG to my trade association because it is the most economical way of obtaining the dozens of services it has to offer. A department of my business devoted to such matters would cost many times over what I pay in dues, and many of these services would be impossible for an individual company to supply for itself. In any case, such an important adjunct to my business would be extremely expensive—practically out of the question.

I belong to my trade association because it is the only agency in the United States that can effectively deal with the public relations problems of the industry; because it wields tremendous influence in enhancing buyers' acceptance for our products and creates a vastly more healthy market background in which to do business. I value very highly the special services covering cost accounting, technical and industry information, safety and hygiene, business ethics, co-operative advertising, statistics, industrial relations and dozens of others for which I rely on my trade association.

I have reduced the cost of membership to cents-per-hour and find that it's much less than I'd pay one common laborer—for which I have the benefit of the services of a group of specialists to deal with the problems on which I need outside help.

I believe that every industry should have a strong, aggressive trade association to represent it in Washington, to do collectively what producers in the industry can't do at all individually, or can't do as economically, or as well. If my trade association is doing a "heads-up" job, it deserves my loyal support—both morally and financially. If it is not doing all that I think it should, it's up to me to see to it that it does. In either circumstance, membership is a "must."

That's the positive side of association membership.

I am not going to expect impossible or improper things from my trade association.

I do not expect, nor do I want, my trade association to try to do my selling job for me. That's exclusively my responsibility. Nor do I want my trade association trying to do my competitors' selling for them. The organization can prepare and distribute ideas and materials which can be used voluntarily by progressive units in the industry for sales promotional purposes, but when it comes to the actual consummation of sales, that's up to me and to each individual unit in the industry, acting alone.

I will not condemn my trade association and drop out of the membership because a competitor, who may be a member, has pulled an unethical trick on me. After all, a trade association has no police power—no right to compel anyone to do anything. That would be "in restraint of trade" and expose the organization to antitrust charges. If one or more of my competitors just won't listen to reason, is ruthless and acts irrationally, it's just too bad. But it's my responsibility. After all, my company chose to engage in this business and it must meet the competition it finds there, without outside help.

I do not want and certainly do not expect my association to bargain collectively on behalf of the industry or any part thereof, or to take any part in labor negotiations on behalf of my company. After all, that is my company's responsibility.

I will not expect my trade association to do things which my company could do, and perhaps many of my competitors are doing, for themselves. I can't expect my trade association to prepare copy and layouts for ads to be published by my company over my company's signature. I can't expect the association to handle matters for which executives and the supervisory staff of my company are paid.

I will not expect my trade association to give consultation services which, if established, would infringe upon the market for the services of private consultants. If such practitioners are able and competent, there would be no excuse for the association to set up in business in competition with them. It's their bread and butter.

I will not look to my trade association for relief against prices for my raw materials or labor which seem too high. After all, the trade association has no more right to approach suppliers of the industry than our customers' trade associations would have to approach my trade association seeking a reduction in the prices my industry is charging for its products. After all, prices vary among units of an industry and it is an impossibility to treat them collectively—even if it were legal, which I very much doubt.

In short, I will not expect my trade association to do the things I'm paid to do. Nor will I expect automatic and miraculous benefits and valuable returns from my membership without my turning a hand.

I will not "beef" about sins of omission or commission of my trade association if I have done nothing to help guide the organization in the formulation of its policies or in the development of its projects and activities.

If all other members are satisfied that the dues are fairly and equitably apportioned and, in the aggregate, are geared to the job to be done by the trade association, I will not plead "dues too high or unfairly assessed" as an excuse to dodge my responsibility to my industry or to shirk my company's obligation to shoulder its fair share of the financial load needed to make my trade association the outstanding and valuable instrument it should be.

I will not expect my trade association to concern itself with selling prices nor to exert any effort to stabilize prices in my industry. I know that such things cannot be done legally.

I'll put in my oar to improve and perfect, but I'll never resign.

SUPER-ANNEALSHOT *and* GRIT

Top quality malleable abrasives . . . mass-produced in automatic, continuous-feed furnaces . . . and the savings passed along to you.
Send for samples and prices.

METAL BLAST, INC.

872 East 67th Street, Cleveland 3, Ohio • EXpress 1-4277

20% to 50%

production increase with first

HANDY SANDY

brings repeat order

from Attwood Brass Works
Grand Rapids, Michigan

The Handy Sandy has proved that it cuts foundry costs and increases molders' production by eliminating hand shoveling for molders. The savings it makes have been demonstrated by foundrymen in their own plants . . . who now are sending in repeat orders because of these savings.

One of these repeat users is the Attwood Brass Works where use of the Handy Sandy has increased the output of molders from 20% to 50% depending upon the job. Complete records, kept by Attwood since the Handy Sandys were installed show that 2 molders now produce as much as 3 did when filling the flasks by hand shoveling.

Mr. C. H. Attwood says "The Handy Sandy is an outstanding method of low-cost mechanization which helps the small foundry keep pace in this highly mechanized age. It has made the molders' job easier and has helped labor relations. It has improved the quality of castings because of the finer texture of the sand."

Yes, the Handy Sandy takes the shovel out of the molder's hand and lets him devote full time to molding. It puts the sand overhead to eliminate "shovel-fatigue." He just pulls a lever or operates an air valve and the sand drops into the flask. It's as simple as that.

It's easy, too, to see that Handy Sandy is doing a real cost-cutting job. The partial list of repeat users below testifies to this. Make a date to see a Handy Sandy in operation. Airmail your request today for prices, free bulletins and free list of users.

these firms have reordered after HANDY SANDY proved itself in their plant

	Times reordered
ANDERSON BRASS WORKS, Birmingham, Alabama	2
CAPITAL BRASS & ALUMINUM FDRY. CO., Chicago, Ill.	1
ELKHART BRASS MFG. CO., Elkhart, Indiana	1
MICHIGAN WHEEL CO., Grand Rapids, Mich.	1
CHEMUNG FOUNDRY CO., Elmira, New York	1
HAMILTON BRASS & ALUM. CASTGS. CO., Hamilton, Ohio	2
F. E. MYERS & BROS. CO., Ashland, Ohio	1

NEWAYGO | ENGINEERING COMPANY

NEWAYGO, MICHIGAN

Manufacturers of Noway Mold Handling, Sand Handling and Conditioning Equipment.

Foundry STATISTICS

Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1949	1950
Jan.	149.9	159.3
Feb.	144.4	113.1
Mar.	190.8	225.2
Apr.	172.0	160.6
May	121.9	294.9
June	164.9	622.7
July	146.6	401.8
Aug.	127.1	....
Sept.	166.6	....
Oct.	133.5	....
Nov.	270.4	....
Dec.	201.0	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Foundry Production Workers

Estimated Number

	May 1950	Apr. 1950	May 1949
Iron & Steel	192,900	188,100	186,300
Nonferrous	73,500	70,700	59,900

Average Weekly Earnings

Gray Iron	$63.44	$61.96	$50.47
Malleable Iron	63.40	63.49	51.60
Steel	63.49	62.83	55.72
Nonferrous	65.36	64.03	59.01

Average Weekly Hours

Gray Iron	41.9	41.2	35.1
Malleable Iron	40.8	40.7	34.4
Steel	40.7	40.3	36.8
Nonferrous	40.9	40.5	37.9

Labor Turnover Rate (May)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	4.5	3.5	1.8	1.2
Malleable Iron	6.0	3.5	2.6	0.2
Steel	5.6	2.9	1.7	0.7
Nonferrous	6.0	3.0	1.6	0.9

Source: Bureau of Labor Statistics.

Ingot Brass and Bronze

(Shipments in net tons)

	1949	1950
Jan.	19,456	18,874
Feb.	15,026	18,487
Mar.	14,550	22,494
Apr.	10,695	22,118
May	11,114	23,643
June	9,696	25,093
July	10,220	21,609
Aug.	14,194	.....

Source: Ingot Brass and Bronze Industry.

Shipments of Castings

(Reported by Bureau of the Census)

Gray Iron

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1948			
Total	12,785,909	7,131,405	.....
1949			
May	866,631	439,420	1,243,266
June	905,573	455,442	1,086,989
July	696,915	341,657	1,031,963
Aug.	872,013	445,981	1,048,308
Sept.	880,647	459,014	980,070
Oct.	715,685	397,939	955,100
Nov.	718,703	395,107	938,629
Dec.	862,172	440,409	892,458
Total	10,549,284	5,517,527	.....
1950			
Jan.	913,321	449,577	914,185
Feb.	864,189	416,594	873,455
Mar.	995,782	500,195	921,575
Apr.	981,126	483,862	922,255
May	1,095,111	572,887	977,833
June	1,136,129	613,084	1,039,619

Steel

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1948			
Total	1,760,032	1,335,295	.....
1949			
May	106,178	75,537	191,473
June	116,052	84,112	173,237
July	78,710	50,124	155,494
Aug.	89,964	59,412	143,566
Sept.	86,502	55,853	127,664
Oct.	70,690	48,263	124,817
Nov.	76,437	50,685	117,865
Dec.	84,508	53,079	122,887
Total	1,243,502	865,297	.....
1950			
Jan.	88,821	57,996	142,484
Feb.	91,827	62,045	165,186
Mar.	111,772	77,588	185,611
Apr.	106,964	75,133	201,643
May	117,944	83,845	198,078
June	130,491	94,637	206,799

Malleable

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1948			
Total	933,265	525,212	.....
1949			
May	54,572	27,643	78,944
June	59,597	32,639	69,865
July	44,360	23,216	70,796
Aug.	58,121	30,327	61,330
Sept.	60,488	30,646	57,512
Oct.	57,150	28,582	54,322
Nov.	49,439	25,250	55,795
Dec.	57,379	29,679	60,835
Total	713,107	370,967	.....
1950			
Jan.	62,874	32,918	62,307
Feb.	60,386	31,249	67,049
Mar.	66,259	38,639	69,866
Apr.	69,822	36,279	76,250
May	76,161	42,432	77,074
June	82,345	46,613	86,783

Aluminum

(Thousands of pounds)

	Shipments Total	Sand	Perm. Mold	Die	Unfilled *Orders
1948					
Total	424,490	139,781	161,334	118,738	.....
1949					
May	21,392	7,582	7,293	5,994	41,460
June	23,261	8,668	7,790	6,257	38,159
July	18,621	6,311	6,592	5,180	36,993
Aug.	23,997	9,048	8,326	6,119	38,130
Sept.	27,546	9,923	9,491	7,623	38,179
Oct.	29,071	9,634	9,923	8,908	37,881
Nov.	26,317	9,212	8,315	8,348	36,846
Dec.	26,762	10,070	7,714	8,430	36,921
Total	304,616	106,825	102,908	88,019	.....
1950					
Jan.	28,801	9,646	9,400	9,052	40,591
Feb.	28,887	10,171	9,358	8,851	44,235
Mar.	35,845	13,035	11,094	10,870	47,350
Apr.	33,356	11,091	10,656	10,795	49,952
May	36,031	11,526	11,928	11,799*	52,580
June	37,600	12,677	11,825	12,173	53,309

Magnesium

(Thousands of pounds)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1948			
Total	8,214	7,488	....
1949			
May	778	726	2,885
June	799	759	3,025
July	689	637	3,073
Aug.	753	712	3,107
Sept.	727	691	3,015
Oct.	796	763	3,050
Nov.	801	769	2,399
Dec.	781	738	2,216
Total	9,364	8,781	....
1950			
Jan.	814	762	2,237
Feb.	735	676	2,218
Mar.	903	849	2,322
Apr.	799	751	2,305
May	810	762	2,282
June	758	698	2,482

Copper-base Alloys

(Thousands of pounds)

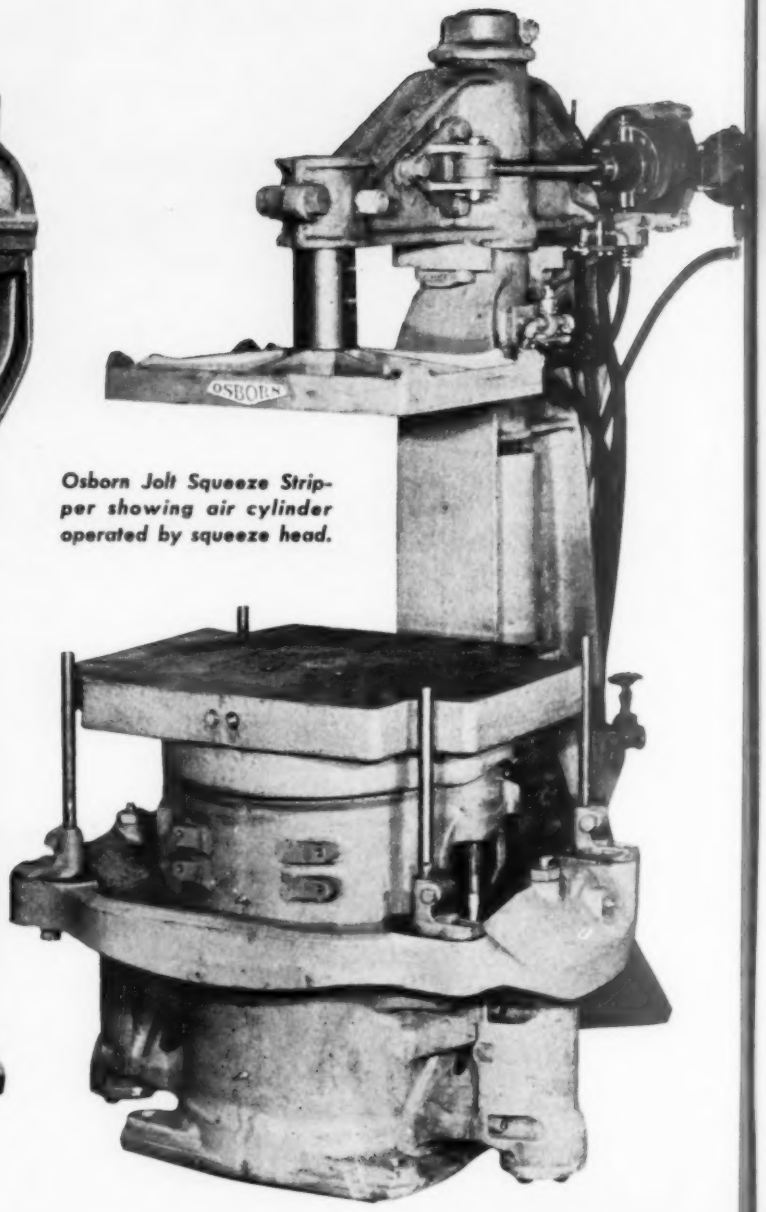
	Shipments Total	Sand	Perm. Mold	Unfilled *Orders
1948				
Total	1,030,825	930,790	59,009	.....
1949				
May	53,699	48,004	2,830	30,926
June	52,616	47,678	2,552	26,786
July	43,273	39,372	2,129	26,013
Aug.	58,055	53,203	2,929	26,071
Sept.	60,771	55,221	2,729	26,527
Oct.	58,249	52,861	2,316	23,634
Nov.	61,818	56,669	2,811	23,625
Dec.	63,873	58,291	3,086	23,435
Total	725,318	654,444	37,311	.....
1950				
Jan.	65,585	58,878	3,440	25,216
Feb.	67,029	60,257	3,626	26,923
Mar.	80,442	71,876	4,693	27,631
Apr.	72,318	64,773	3,848	28,769
May	79,108	71,605	3,751	30,880
June	83,023	74,990	3,896	32,808

* For sale only.

HERE'S WHY OSBORN JOLTS

RATE *First*

Osborn Jolt Squeeze Stripper equipped with standard manually operated valves.



Osborn Jolt Squeeze Stripper showing air cylinder operated by squeeze head.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

SQUEEZE STRIPPERS

with Foundrymen

- **Dependable Construction backed by years of Osborn foundry-proven experience**
- **Hard Effective Jolt**
- **Wide Range to Choose From... diameters of squeeze pistons ranging from 10" to 26"**
- **Adjustable Lift Pins to accommodate a variety of flask sizes**
- **Oil Controlled Precision Pattern Draw**
- **Optional Features**
  - Power operated squeeze head
  - Side roll-on and roll-off
  - Automatic controls
- **Smaller machines available in portable design**

Osborn Jolt Squeeze Stripper with automatic control and side roll-on and roll-off feature.

OSBORN

MOULDING MACHINES **CORE BLOWING MACHINES**

MEMBER

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

MAN·TO·MAN on the Molder's Bench

"Bosses"

By RALPH L. LEE

A short time ago—just a matter of weeks—I had a real treat. I visited an old boss of mine, a fellow I worked for about 38 years ago. Hardly a year has passed in all that time in which we had not written or gotten in touch with each other one way or another, although we hadn't seen much of each other. So this visit I'm talking about was something I had long looked forward to.

As soon as I got to his town I called him up and, without too much of a struggle, finagled an invitation out of him. I swear to goodness that in spite of all the years that had flowed over his dam and mine, by heck, if he didn't look to me just as I had been picturing him, and he seemed to be the same fine fellow he was when I last saw him, although I imagine there were changes in both of us others might have noticed.

We had hardly gotten through the howdies when it seemed to me that a curtain came down on all the years that had passed since I worked for him, and in my memory we were back again in old Assembly A at the National Cash Register works in Dayton. It was so real I believe I could have put on my apron and taken up my work where I left off.

We recalled all the boys we had worked with at that time and what surprised me was that their names came back to me, names I hadn't thought of in years and those which I know darn well I couldn't possibly have recalled any place else on earth except sitting there face to face with my old boss.

I reminded Mr. Storms (even to this day I wouldn't even think of calling him Earl) of the time I found him standing behind me as I was laying out a piece of work from a drawing I had made exactly to scale. He watched me for a moment as I read each dimension off the drawing and carefully laid out the holes on the piece accordingly. "By the way, Ralph," he asked, "is that drawing to scale?" I told him it was. "Then let me have it for a moment." He took the drawing, laid it down carefully on the piece I was making, and center-punched the holes through the drawing. I remember I looked at him in amazement when he told me, "Go ahead and drill it. I think you'll find it o.k." And by heck I did.

Mr. Storms had a great laugh over this incident and made the comment that he hadn't the slightest idea at the time that I would be remembering it for so many years to come. He seemed to be very much pleased; in fact, he almost blushed when I told him that the principle he'd demonstrated of getting down to brass tacks in a hurry by cutting through needless red tape had played an important part in shaping my life.

Our wandering conversation led to a job I had done, one that I'll admit I felt quite good about at the time, but surely not one that my boss would remember for so long. I didn't know that this particular job was probably one of the things that settled the matter of a promotion that followed later.

I don't think that until he and I got together on this visit, Mr. Storms had ever realized the lasting impressions and the powerful influence the things I saw him do or heard him say were destined to have over me in all the years that were to follow, and I'm equally certain that I never even dreamed that many of the things I did or said on the job, both good and bad, would be remembered as long as they were.

I had only intended to stay long enough to say hello, pay my respects and chew the fat a bit, but the hands of the clock went round like crazy. Before I knew it I was sitting at lunch with him and his good spouse.. Toward evening a visit to Mr. Storms' hobby workshop in the basement had to be cut short by an appointment I couldn't get out of.

Coming away from his house that evening, I felt darn good down inside, not only because I had paid my respects to a grand old fellow who had meant so much to me but the knowledge that I had meant something to him too. On the other hand, that good feeling had to fight a bit with another feeling of uneasiness.

I don't believe I had ever realized before how much and how long we unknowingly influence others by the things we do and say as we go about our daily chores. Getting done the immediate *must* job of course will always have first call on any boss worthy of the name, but I couldn't help but think, in going back over all the bosses I had had, that the importance of the must job that's up fades away like smoke in the years to come when compared with the terrible importance of these lasting impressions we unknowingly make on the lives and fortunes of those who look to us for guidance and counsel.

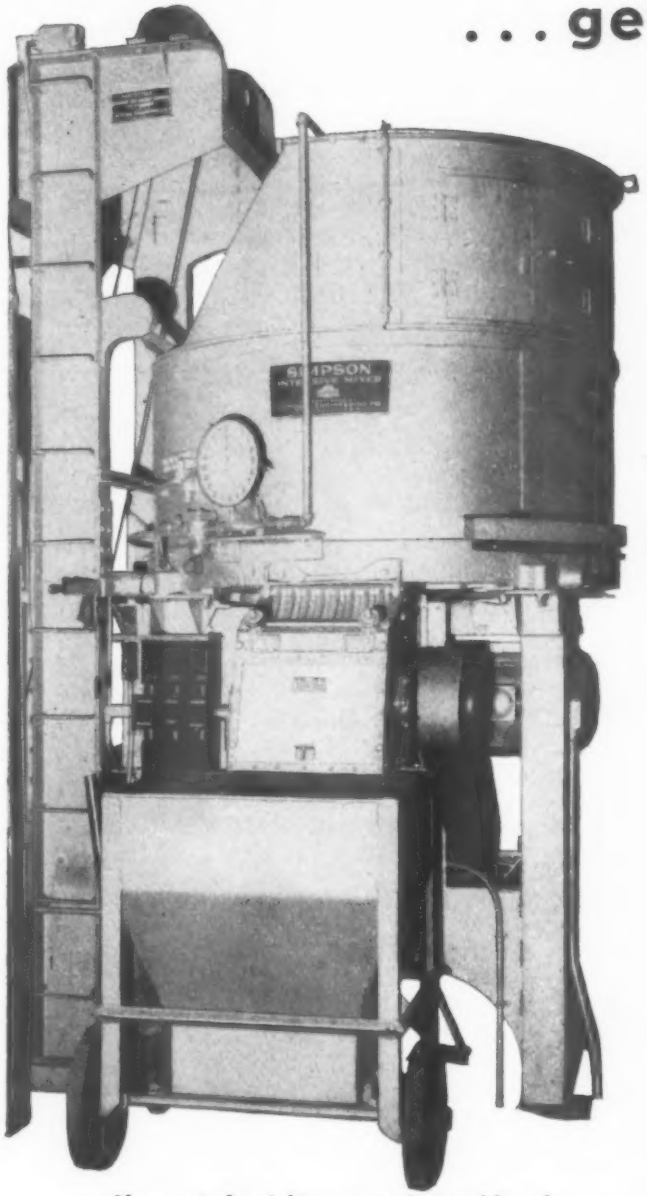
What this line of thinking does for me at least is to blast into kingdom come the fallacy that all is fair in love and war, that the end justifies the means and that as long as we get the stuff out, our bossing job is done.

The records in the front office, of course, show current production, the meeting of due dates, scrap, costs and all that sort of thing. But in the light of this little story, there are other records, unwritten records which will remain for all time, those which cannot be doctored or erased: —Records down inside the folks we

(*Concluded on page* 138)

Before you buy ANY Mixer...

...get the answers to these QUESTIONS:



Shown at the right are actual capacities of some Simpson Mixer models. For more complete data, ask to have a National Engineer present additional facts and figures. Call or write today.

- **What is the *actual* batch size in *pounds* that the mixer will handle on a daily production basis without overloading?**
- **How many tons of *properly prepared* sand will the mixer produce per hour, per day?**
- **How much horsepower is required *per ton* of *properly prepared* sand?**

UNDER today's conditions, the answers to these important questions are more vital to *efficient* and *profitable* foundry operation than ever before. When you use SIMPSON Intensive Mixers, you'll find that the answers are on the *plus* side . . . with more productive capacity, lower initial cost, and less operating cost . . . based on actual operating data secured on the job in hundreds of foundries all over the country.

POUNDS PER HOUR OF PROPERLY PREPARED SAND WITH SIMPSON INTENSIVE MIXERS

SIMPSON MIXER MODEL	MAX. HORSE-POWER	BATCH SIZE IN POUNDS	2 MINUTE CYCLE	3 MINUTE CYCLE
No. 2	20	1,500	45,000	30,000
No. 3	50	3,000	90,000	60,000

Complete details on capacities of other Simpson Mixer models will be furnished on request

SIMPSON Intensive MIXERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—George Fischer Limited, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia

(*Concluded from page* 136)
are responsible for, a record of whether their work with us left them better off or worse off.

Figures on the right side of this ledger probably have more to do with the lasting profit and progress of a foundry gang than all the other data put together. And speaking as a follower, there's another set of figures having to do with us down inside the boss, just as indelible and just as important in terms of us getting ahead. So it looks as though everybody, both leader and follower has to watch his step on this tight rope we all have to walk in the foundry business.

Meeting on Quality Control Planned

American Society for Quality Control will hold its fifth annual convention at Hotel Cleveland and Cleveland Public Auditorium, Cleveland, May 23-24, 1951.

With the theme "Quality Control, Today's Foundation for Tomorrow's Reputation," the convention will feature discussions on applications of quality control in diverse industries, including the foundry industry, and technical aspects of the use of statistical methods. Training sessions will be offered for those desiring basic training in quality control.

Manufacturers' displays will show gages and testing equipment used in quality control work and applications utilizing quality control techniques in processing and inspection.

Story of Aluminum

Reynolds Metals Co., 2500 South Third St., Louisville 1, has published a 96-page, 6 x 9-in. book which tells where aluminum comes from and how it is made, and describes its use in many everyday products. A series of 69 pictures and charts supplement the text.

Meetings of Interest to Foundrymen

Oct. 5-6—Texas Regional Foundry Conference, sponsored by Texas Chapter and Texas A. & M. Student Chapters of AFS, Plaza Hotel, San Antonio, Tex.

Oct. 12-14—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 12-13—Gray Iron Founders' Society, annual meeting, Netherland Plaza Hotel, Cincinnati.

Oct. 13-14—Northwest Regional Foundry Conference, sponsored by Washington, British Columbia, Oregon Chapters and Oregon State College Student Chapter of AFS, Gowman Hotel, Seattle

Oct. 13-15—Non-Ferrous Founders' Society, annual meeting, Hotel Statler, Boston

Oct. 16-20—National Safety Congress and Exposition, Congress, La Salle, Morrison, and Stevens Hotels, Chicago

Oct. 23-27—National Metal Congress and Exposition sponsored by American Society for Metals, American Welding Society, Metals Branch—American Institute of Mining and Metallurgical Engineers, and Society for Non-Destructive Testing, International Amphitheatre, Chicago

Oct. 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Oct. 27-28—New England Regional Foundry Conference, New England Foundrymen's Society, Massachusetts Institute of Technology, Cambridge, Mass.

Nov. 2-3—Metals Casting Conference, sponsored by Purdue University with Central Indiana and Michiana Chapters of AFS, Purdue University, West Lafayette, Ind.

Nov. 2-3—Annual Conference on X-ray and Electron Diffraction, Mellon Institute for Industrial Research, Pittsburgh

Nov. 3—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

Nov. 9-10—Meehanite Casting Manufacturers, annual convention, Hotel Knickerbocker, Chicago

Nov. 9-10 — National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago

Nov. 9-11—Steel Founders' Society of America, annual technical and operating conference, Carter Hotel, Cleveland

Nov. 10-11—Michigan Regional Foundry Conference, sponsored by Michigan AFS Chapters and Michigan State College, Michigan State College, East Lansing, Mich.

Dec. 1—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

1951

Jan. 19—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland

Jan. 22-26—American Society of Heating & Ventilating Engineers, exposition and annual meeting, Commercial Museum, Philadelphia

Feb. 8-9—Wisconsin Regional Foundry Conference, sponsored by Wisconsin Chapter of AFS and University of Wisconsin, Schroeder Hotel, Milwaukee

Feb. 22-23—Birmingham Regional Foundry Conference, Birmingham District Chapter and University of Alabama Student Chapter of the AFS, Tutwiler Hotel, Birmingham

Feb. 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Mar. 2—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

Mar. 5-9—American Society for Testing Materials, committee week, Netherland Plaza Hotel, Cincinnati

Mar. 9-10—Ohio Regional Foundry Conference, sponsored by Ohio Chapters and Ohio State University Student Chapter of AFS, Case Institute of Technology, Cleveland

Mar. 19-23—Western Metal Congress & Exposition, Civic Auditoriums, Oakland, Calif.

Mar. 23—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

Apr. 23-26—American Foundrymen's Society, annual convention, Buffalo

Apr. 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

May 18—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

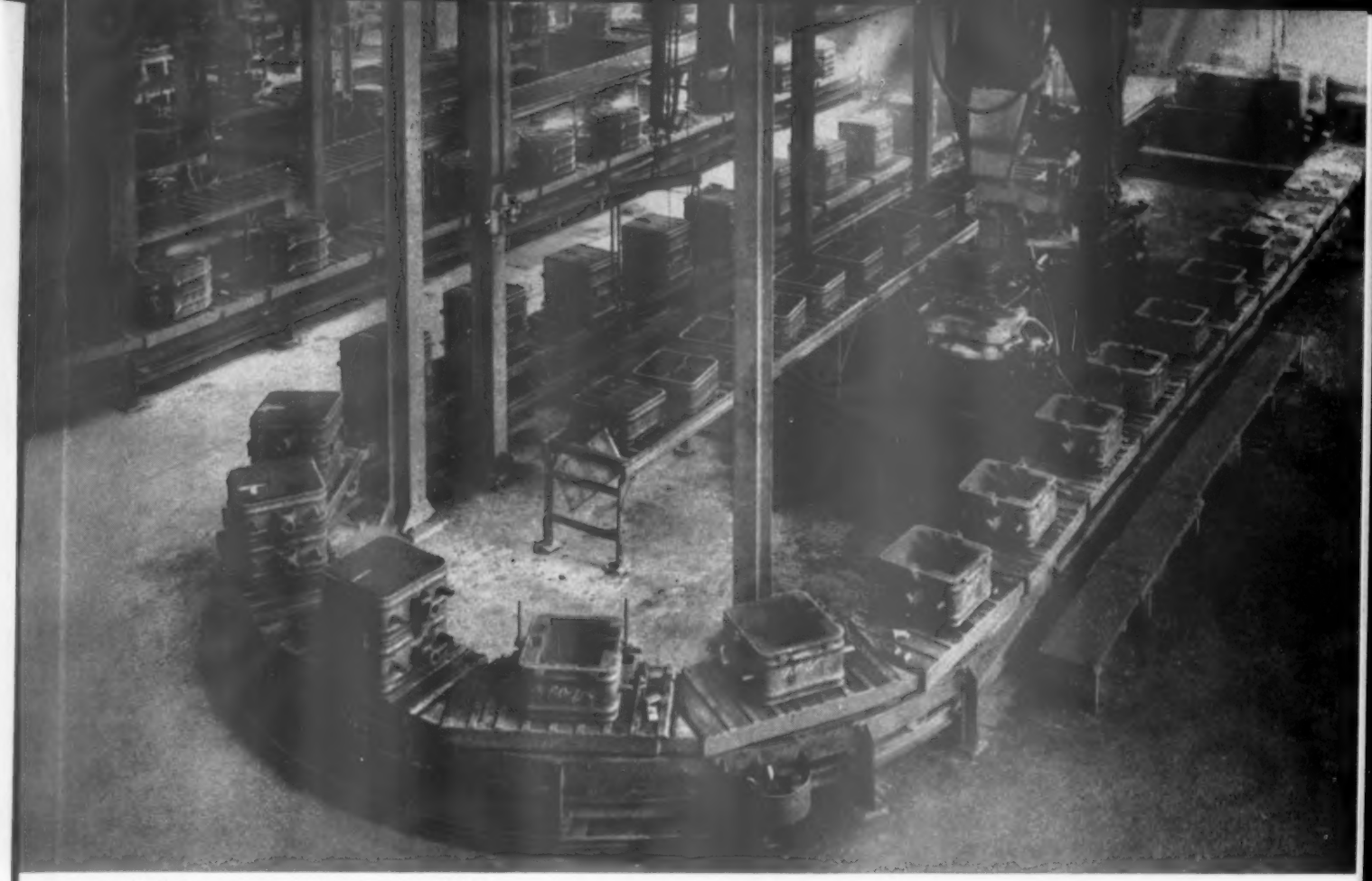
May 23-24—American Society for Quality Control, annual convention, Hotel Cleveland, Cleveland

May 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 18-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hotel, Atlantic City, N. J.

June 21-22—Malleable Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

July 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago



Above: Mold Conveyors in Jobbing Foundry Making Large Castings Showing Sand Plant Inside the Loop.

Mold Conveyors, Shakeout, and Castings Cooling and Sorting Conveyor in Low Cost Jobbing Foundry.

Floor Pouring in Jobbing Foundry Making Large Engine Parts Showing Sand Plant and Overhead Sand Return.

Jobbing Foundries

should mechanize too!

● If your work is adapted to molding machines, sand slingers, or a centralized shakeout, it will pay you to mechanize further.

Mechanical handling of shakeout sand; mechanized screening and sand conditioning; overhead sand return; mold conveyors operated intermittently or continuously; and mechanized castings handling, is enabling jobbing foundries — making big castings and small castings — to synchronize their operations, increase production and cut their costs. The C. O. Bartlett & Snow Co., 6201 Harvard Avenue, Cleveland 5, Ohio.

DESIGNERS

ENGINEERS

BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS

ERECTORS

Readers' COMMENT

Pouring and Warping

TO THE EDITORS:

I noted with some consternation the answer to the question on page 100 of the August FOUNDRY, "Has Difficulty with Warping."

I am frequently confronted with warping and casting stresses, and the one effective rule I use is to pour the metal as rapidly as possible. This always reduces the warping and stresses. This is explained simply on the basis that slow pouring causes different rates of freezing from cold to hot casting areas; thus causing the last metal to freeze to stress strain the already frozen portions of the casting.

Rapid pouring tends toward uniform metal temperature in the mold, which allows for the most uniform freezing of the casting with minimum stresses and, incidentally, the least progressive freezing.

This is one gating method that is not a conjecture and, therefore, the facts should remain as straight as the casting is desired.

FRED G. SEFING
Development and Research Division
International Nickel Co. Inc.
New York

* * *

Suggests Two Procedures

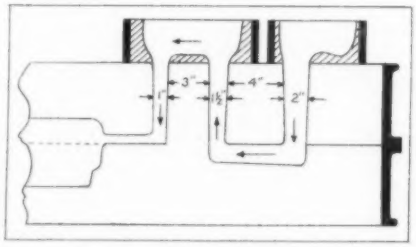
TO THE EDITORS:

I have been a reader of THE FOUNDRY for many years and have admired and agreed with your answers to questions several times. The question has come up regarding dirt and other troubles in castings for machining. I am enclosing a rough sketch of a fool-proof way of pouring a casting which, after 50 years in foundry work, I have never found to fail, nor have I found any better method.

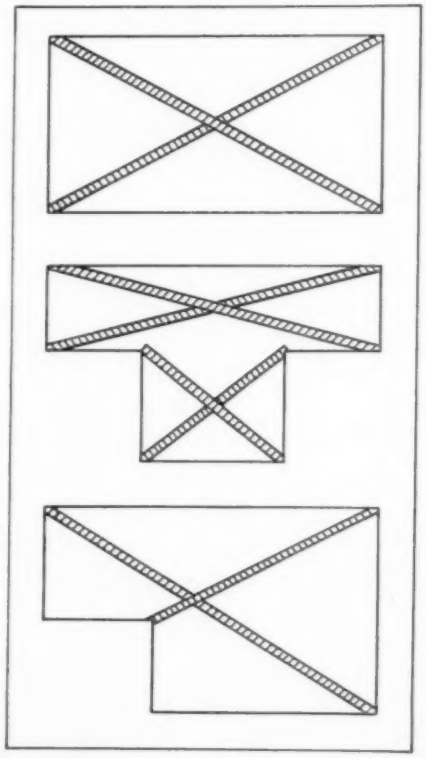
Explanation is to use three runner pegs. First is 2 in. in diam, second is 1½ in., and the third is 1 in. The 2-in. sprue has a runner box or bush to itself while the 1½ and 1-in. sprues use the same bush as indicated. In pouring down the 2-in. sprue, the metal goes up the 1½-in. sprue and down the 1-in. sprue to enter the mold cavity. Therefore, no scum or dirt can enter the mold. Keep the 2-in. bush full of metal as it cannot go down the 1-in. sprue as fast as it comes up the 1½-in. sprue.

I also am passing along some information for keeping plate castings —say 42 x 42 in. or 48 x 48 in. or any other size from ½-in. thick and upward—from warping. If they are made in open sand, as soon as the metal is set sufficiently, riddle dry sand ¼-in. thick on the plate and then shovel the sand around the plate to a 3 or 4-in. thickness. Then bare the casting from corner to corner 2 in. wide. Operation must be done quickly, and you will find the plate perfectly level. If the plate is covered with a cope, take the cope off, but knock out the sand as you raise the cope. Level off sand with the shovel, and bare as in the case of the open sand casting. Important thing to do is to cross from corner to corner so you can see the metal.

ROBERT HOLLAND
Works Manager
Dominion Wheel & Foundries Ltd.
Coburg, Ont.



Sketch showing arrangement of sprues to prevent dirt and scum from entering mold cavity



Cross-hatched sections indicate portions of casting exposed to air by removal of sand

* * *

The Croning Process

TO THE EDITORS:

In the article "Plastic Bonded Shell Molds Used in New Casting Process," published in your August issue, p. 92, reference is made to the use of the Croning process in Germany during the late war years. Dr. Eugen Piwowarsky is cited as author of the statement that the Croning process was employed successfully in the manufacture of cores for hand grenades. In a statement notarized in Aachen, Germany, April 14, 1950, Dr. Piwowarsky has amended his comments on this subject as follows:

"In referring in my article of Feb. 19, 1948, page 181 of the English trade paper *Foundry Trade Journal*, to the so-called 'C-method' as having been practiced during the war, I did not intend to refer to the present conforming method known as the 'C-method' which was not known to me in detail at that time since the inventor had not yet made any specific disclosures in regard thereto. My statements in the above-mentioned trade paper, however, referred to a method which perhaps may be considered to be the precursor of the present 'C-method' but fundamentally differs therefrom in that the formerly used conforming material comprised a liquid dross. In accordance with what I have learned in the meantime the use of a liquid dross of that type did not lead to any satisfactory results, which fact caused the inventor to look for a different method which in its final embodiment became only gradually known. In regard to this new method nothing was known to me prior to 1946, not to mention the fact that it was not being used in Germany during the last war."

A photostatic copy of the declaration is enclosed.

(*Concluded on page* 142)

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(*Continued from page* 140)

Another factor which has a bearing on whether or not this process comes under the heading of "Captured Information" is the report by William W. McCulloch for the U. S. Government Office of Technical Services. The original report stated that the author visited Croning in Germany, Apr. 24-25, 1945, to obtain the information compiled. Early this year the Department of Commerce issued a correction, stating that Mr. McCulloch's visit was in 1947 rather than in 1945.

HERBERT C. FISHER
Managing Trustee
Crown Casting Associates
75 Federal St., Boston

Book Review

The Foreman's Production Job, by A. L. Kress and T. O. Armstrong, cloth, 152 pages, 5¼ x 8¼ in., published by the National Foreman's Institute, New London, Conn. Price $2.50.

This is a third of a series of books on standard management practice and relates to the duties of the foreman in connection with production. The first section treats the factory organization, the foreman's part in maintenance, production control and quality control. The second section discusses the foreman's job in managing such factors as production, quality control, cost control, methods of improvement, wage determination, accident prevention, and industrial relations.

Disk Grinding

Grinding Wheel Institute, P.O. Box 64, Greendale, Mass., has published a booklet intitled "Disc Grinding." Text and illustrations describe methods of operation peculiar to disk grinding operations. Sections of the booklet deal with methods of mounting abrasive disks, steel disk wheels, abrasive disks, mounting screws and studs, mounting procedure, storage of abrasive disks, care in handling, operation speeds, and protection devices.

Improved Materials Handling
BOOSTS FOUNDRY OUTPUT

WITH the installation of electric fork trucks to work in conjunction with powered belt conveyors and an extensive overhead conveyor system, the Taylor & Boggis Foundry Co., Euclid, O., has obtained a 40 per cent increase in material movement throughout all of the foundry's departments. Productionwise, this means a 40 per cent gain in tonnage while maintaining a labor force of the same size as before the trucks were put into operation. In addition, the trucks assure dependability of process flow.

The trucks used are a new type FT 3000-lb-capacity center control fork truck, particularly well suited here because of the congested production areas and narrow aisles, and two other type 3000-lb-capacity center control fork trucks, all made by the Baker Industrial Truck Division of the Baker-Raulang Co., Cleveland. The FT type truck has a 70-degree maximum steering angle, and this, plus a 43-in. wheelbase, results in an outside turning radius of only 73 in. and permits using the truck in 64-in. intersecting aisles and in congested working areas.

Although all three trucks are in continuous service, the FT receives greatest demand for transferring castings from the shakeout conveyor to the cleaning department. Loaded tote boxes brought from the shakeout conveyor unloading area average about 2700 lb. Although the tote boxes are often stacked as much as four high to take full advantage of available storage capacity, there are times when congested conditions do develop.

The trucks also are used to transfer castings from the cleaning department to the inspection department, and then to the shipping department, as well as for other handling tasks within the plant. Consequently, the trucks are in virtually continuous service. During the first shift the battery is changed after 6 hours of operation; for the rest of the working day it is changed twice more, each time after 9 hours operation.

The trucks also have speeded handling of material in receiving and shipping. Castings are delivered to the shipping area in tote boxes after inspection and are stored there until time of shipment. Here storage space has been increased 50 per cent by stacking with the use of the fork truck. All of the castings are shipped via highway carriers which are loaded by means of the fork truck.

(*Continued from page* 138)

In the first paper, G. A. Lillieqvist, research director, American Steel Foundries, East Chicago, Ind., dealt with "Influence of Temperature on Fluidity and Surface App... Steel Castings." Th... other investigat... pany's exper... parent, he... control ... is of p...

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Since surface finish of castings is second only in importance to satisfactory service performance, considerable interest was shown in a paper on "Fayalite Reaction in Sand Molds ... Used for Making Steel Castings," pre... by Robert E. Savage, metallur... ...ternational Nickel Co. Inc., ... and Howard F. Taylor, ...stitute of Technol... ...nted at the third ...

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Around THE COUNTRY

PHILADELPHIA — Casting demand here is stepping up rapidly, affecting all branches of the foundry industry. Especially sharp has been the increase in steel casting requirements, including cast armor plate and other defense needs. Various steel foundries are revamping their facilities in preparation for still greater demand and are adding shifts, placing some plants on a 24-hour daily operation.

Pressure for iron castings is ascribed mainly to a desire of manufacturers of commercial metal products to lay in stocks in anticipation of greater stringency in castings later on, and to a switch-over to castings in some cases because of the increasing shortage of steel. For instance, castings for sprocket wheels for roller chain drives are in greater use now that rolled plate is more difficult to obtain for such fabrication. Also demands are greater for chilled iron castings to replace flame hardened steel. Most iron foundries are still operating on a five-day week, although stepping up their rate of melt. With cooler weather now at hand and the business outlook continuing strong, it appears that an increasing number will go to a six-day weekly schedule.

Bronze and brass foundries are active on a five-day basis. Aluminum foundries are busier, reflecting particularly the defense needs of aircraft builders and radar manufacturers.

While there has been only a moderate loss of manpower to the military services thus far, labor supply is tightening. District foundries are relatively free of labor disturbances, although an increasing number of strikes at customers' plants are complicating foundry schedules.

Raw material supplies are scarcer, as reflected in higher prices on nonferrous materials and to some extent on cast iron and malleable scrap. Stringency in pig iron has been increased by the temporary suspension of the larger Swedeland, Pa., stack for repairs. This suspension, however, has provided at least one blessing inasmuch as it has enabled the producer to divert a substantial amount of coke from furnace to foundry grades at a time when supply of the latter was causing increasing concern among foundrymen. Due to scarcity of domestic iron, interest in foreign material is more active and shipments from abroad are increasing. However, prices are higher. Importations of scrap have been primarily for steel mill account, but some tonnage is being brought in by the foundries, one pipe foundry in particular.

The Barium interests have acquired the Chester, Pa., furnace from the government and expect to have it in operation within a few weeks. It will be operated by the Central Iron & Steel Co., Harrisburg, Pa., a Barium subsidiary, and while indications point to the production of basic iron primarily, it is expected that some foundry iron grades will be produced as well.

* * *

CHICAGO — Shortages of various raw materials puts a ceiling on production in many foundries in the district. Iron and coke are the most important stumbling blocks, and indirectly the steel shortage is preventing foundries from expanding production by limiting the quantity of castings which can be used. Manpower also is a limiting factor.

The district's melt is high and would be somewhat greater if several important captive implement foundries were not strikebound. Five and six-day operation is widespread.

As yet no broad cutbacks in consumer goods requiring castings have been necessary. However, some foundry dislocations must be expected as credit curbs, materials allocations and similar measures cramp production. When the kinks are ironed out, castings will be consumed in greater quantities by freight car builders, machine tool makers, and military vehicle producers. Meanwhile, steel foundries are beginning to feel the first impact of the expanded freight car program, and order backlogs at railroad castings suppliers have swollen noticeably.

Some steel foundries now on standby probably will be reactivated. One mothballed open hearth shop here is being examined to determine what equipment and repairs will be needed to ready it for cast armor production.

Scrap last month was involved in a strenuous tug of war. Melters fought to bring prices down to a reasonable level. Traders also exerted considerable pressure to bring the runaway market under control. With pig iron capacity taxed and most blast furnace output channeled into steelmaking, the heavy demand for scrap by mills, converters and foundries made price stabilization an uphill battle.

* * *

NEW YORK—Casting demand is undergoing constant expansion. Due to the Korean situation business throughout July and August gained steadily instead of slumping seasonally. Returns for September are expected to show further improvement, with the trend likely to continue upward throughout the fall.

Malleable iron, steel and nonferrous foundries report mounting backlogs. So far most of these foundries have continued on a five-day weekly schedule, but expect to be working six days as the fall season advances. At least that is the general prospect.

District gray iron foundries so far have not accumulated much backlog. However, they are operating at least five days a week in most instances and a few are on a six-day schedule. Meanwhile, they are stepping up their daily melt. Some gray iron producers are disappointed that there has not been a greater amount of machine tool work; nevertheless they are confident that a swelling volume is inevitable under present emergency conditions. The next few weeks, they believe, will witness a sharp increase in this regard.

Prices are buoyant as the markets on raw materials and labor strengthen. Labor supply is still adequate but tightening.

* * *

PITTSBURGH — Raw material shortages continue to plague foundrymen throughout this district. Attempts to increase production to meet a heavy influx of new orders is prevented by scarcity of pig iron, coke and, to lesser extent, good quality scrap.

Lone merchant foundry iron stack here has yet to attain rated capacity since completion of relining program about mid-August. Some foundries have been forced to order relatively large tonnages of foreign iron at prices comparable to domestic iron. However, supply of good quality foreign iron has tightened considerably

(*Continued on page* 146)

What should you expect of conveying equipment?

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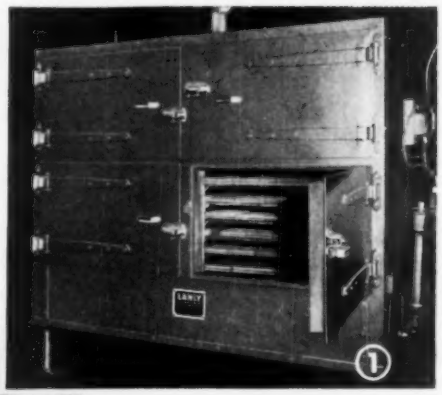
Fig. 1—A Lanly Shelf Type Core Oven is heated by burners directly under the work chamber. Available in several standard sizes.

Fig. 2—A Two Compartment Car Type Mold Drying Oven. Each Compartment individually heated and controlled.



LANLY
CORE AND MOLD OVENS
meet drying needs of all foundries
LARGE OR SMALL

Fig. 3 — A Rack Type Oven which accommodates two racks side by side with a single set of doors.

Fig. 4 — Three Compartment Rack Type Oven with quick change-over combination gas burner equipment.

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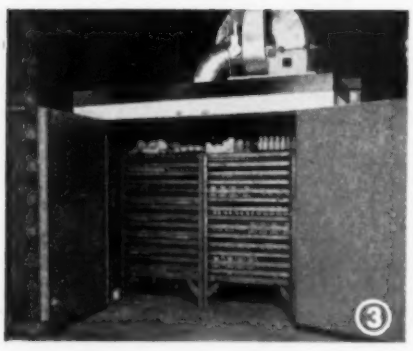

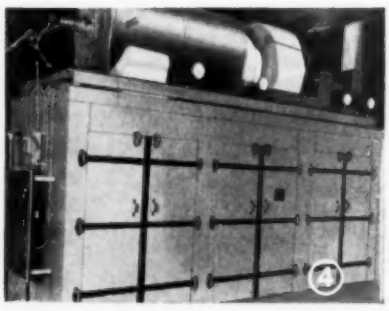

THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
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(*Continued from page* 144)

and deliveries are extended into next year in some instances. Distribution of foundry iron is under virtual allotment; sellers refuse to make commitments more than a month ahead and are rationing output among regular customers.

Growing shortage of oven foundry coke has rejuvenated beehive coke operations and forced slight upturn in quotations for latter grades to range of $15.50-$16.50. Some oven foundry coke continues to be shipped here from Philadelphia, but continuation of strikes at Diamond Alkali and Semet Solvay has accentuated the growing shortage.

Many foundries are offsetting the iron shortage by increasing the proportion of scrap in melting operations. Indicative of this trend is fact that prices for these scrap grades have not softened in line with the trend in open hearth and electric furnace items.

Increased orders are reported by all foundry groups, notably those serving the railroads, also producers of enamelware and heat-resistant castings. One railroad equipment supplier's average daily output is about 75 per cent above that recorded early this year. Theodore E. Mueller, president, American Radiator & Standard Sanitary Corp., states operations in many of the company's plants are at an all-time high. August shipments exceeded those of any previous month and no letup was in evidence throughout September. However, probable restrictions on building activity late this year or early next will adversely affect new order volume within the enamelware trade at that time. Since order backlogs within the industry are at record levels, allocation of output has been necessary.

* * *

BOSTON—Present status of metallurgical developments in nodular cast iron received a thorough discussion at a symposium on the subject sponsored by the Massachusetts Institute of Technology, Sept. 12-13. Held at nearby Swampscott, the two-day meeting was participated in by about 65 metallurgists who have been actively identified with the study and application of this relatively new engineering material. Arrangements were under the direction of Howard F. Taylor of M.I.T.

Scope of the subjects discussed was broadened by the presence of two of the foremost European authorities on nodular iron—H. Morrogh, British Cast Iron Research Association, Birmingham, England, and Prof. Albert De Sy, University of Ghent, Belgium —both of whom presented papers dealing with their investigations.

The considerable time and energy devoted the last two years in studying metallurgical aspects of nodular iron has added markedly to industry's knowledge of the subject. This was evidenced from discussion at the symposium, but it was equally apparent from the conflicting theories advanced for certain phases of nodular iron production that much more research remains to be done.

Output of nodular iron castings this year will total 15,000 to 20,000 tons, it was estimated by A. P. Gagnebin, International Nickel Co., New York. This will include castings ranging from a few ounces to more than 50 tons in weight. Looking to the future he predicted that nodular iron eventually would rank third among engineering materials—its use being exceeded only by wrought steel and gray iron castings—with an annual production of 2 to 5 million tons.

Foundrymen To Meet In New England

Tenth New England Foundry Conference will be held at Massachusetts Institute of Technology, Oct. 27-28. Sponsored by the New England Foundrymen's Association and M.I.T. in co-operation with 11 other engineering and foundry groups, the committee on conference arrangements includes: Chairman, F. M. Fitzgerald, Draper Corp., Hopedale, Mass.; vice chairman, Thomas Curtin, Waltham Foundry Co., Waltham, Mass.; program chairman, Stanley Tims, Saco-Lowell Shops, Biddeford, Me. First session will be at 1:30 p.m., Oct. 27.

Principal speakers and their subjects will be:

"Foundry Costs," by John L. Carter, cost consultant, Gray Iron Founders' Society.

"Better Methods Applied to Foundry Operations," by N. J. Henke, Central Foundry Division, General Motors Corp.

"Foundry Sand," by Charles B. Schureman, Baroid Sales Division, National Lead Co.

"Plastic Bonded Sand Molds," by B. N. Ames, New York Naval Shipyard.

"Cupola Practice," by Thomas Barlow, Eastern Clay Products Inc.

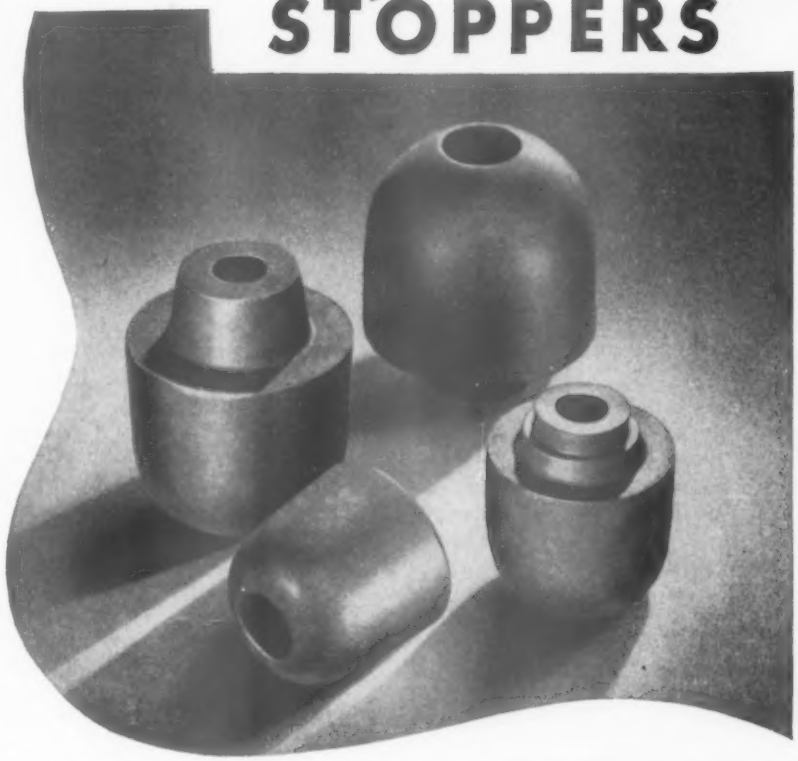
"Humanics," by Ralph L. Lee, General Motors Corp.

"Football as the Referee Sees It," by Paul Swaffield, Hood Rubber Co.

Local representatives of foundry supply companies will sponsor the tenth foundrymen's smoker Saturday evening after the conference, at the Parker House Roof.

Important IN POURING STEEL

DIXON'S Graphite STOPPERS



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Tilting Crucible Pours Permanent Molds

By ARTHUR Q. SMITH
American Gas Association
New York

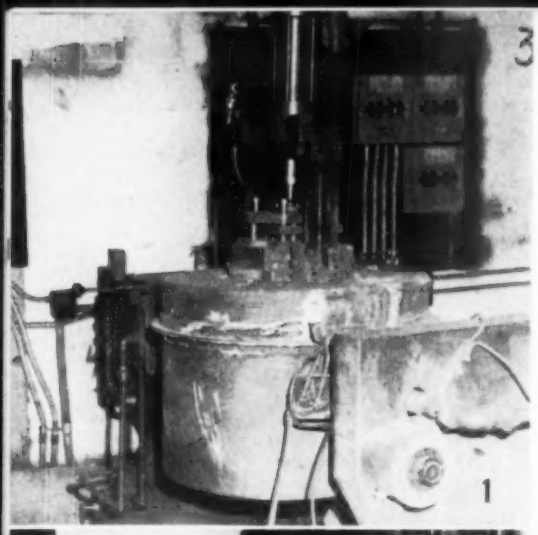
PERMANENT mold aluminum castings are difficult to pour with constant perfection, yet they are most desirable where parts that require little machining are required in large quantities. The ultimate goal of a foundry to produce castings with a minimum of rejects has been attained at Ebaloy Inc., Rockford, Ill., through the use of automatic electronically-controlled gas-fired crucible-casters.

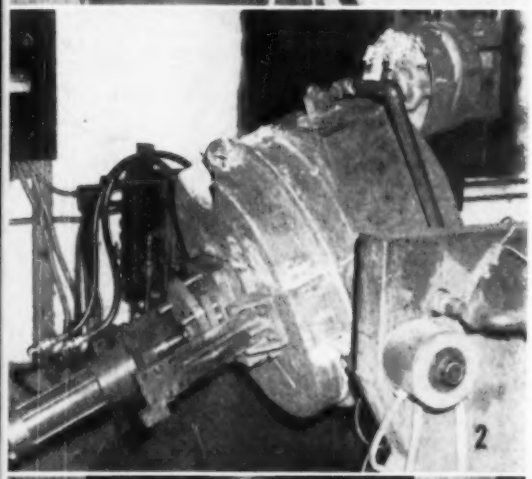
Fig. 1 shows one of the 20 automatic pouring units in this plant. A simple explanation of the apparatus is: A permanent mold is fastened on the top of a tilting crucible so that when it is tilted the molten metal runs into the mold. The entire cycle of operation, though completely automatic, is far more complex.

Approximately 80 pounds of aluminum is held in the pot at from 1250° to 1350° F depending on the alloy for a particular casting. Holding pots are fired by Eclipse buried type blast burners, 50,000 Btu input, with low pressure proportional mixing equipment. When a casting is ready to be poured, the operator presses an actuating button which starts a series of electronically-controlled valves and motor. The mold closes, and the crucible slowly tilts. The rate of flow of the molten metal into the mold is controlled by the speed of the tilting. This regulated speed of tilting assures the filling of the mold at the proper rate.

When the mold is full to the gate, the tilting is automatically stopped, and for a predetermined length of time the entire assembly is held stationary to permit the metal to solidify. This time depends entirely upon the size of the casting and its largest section. When the metal has set, the crucible returns to its normal vertical position, the mold is automatically opened, and the operator removes the casting. Any bits of metal that may have been left in the mold are blown out with an air jet, then the button is pressed again to begin another cycle. One operator can easily handle four of these casting machines making 3 or 4 pound castings. One other operator is required to keep all the holding pots full of metal.

By the use of these casting machines, operating quite slowly, turbulence of the metal is eliminated. Dies are so set that the metal is poured in from the bottom thus tending to equalize the pressure between the die and metal in the pot. The principal advantages of the process are the uniformity of the castings, low rate of rejects, and the cleanliness of the surrounding foundry areas.





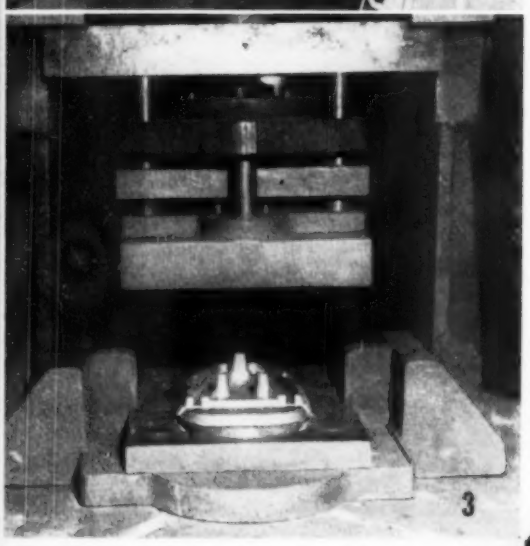


Fig. 1—Tilting crucible in normal position with mold closed and ready for casting

Fig. 2—Casting crucible in tilted stationary position to permit metal in mold to solidify

Fig. 3—Mold opens automatically at end of the cycle to permit removal of the casting

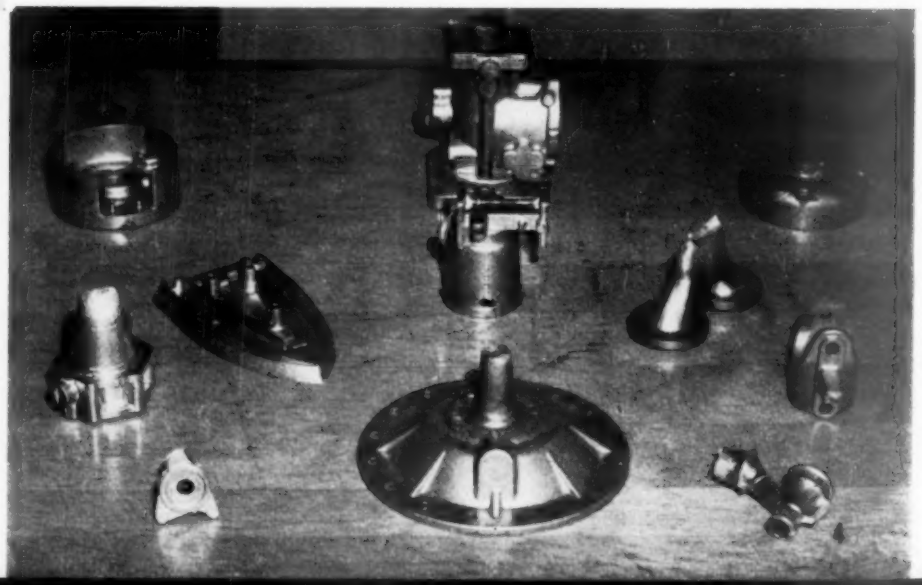


Fig. 4—Typical castings produced by the automatic permanent mold tilting crucible caster

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Western Industrial Supply Co.
208 S.E. Hawthorne Blvd.
Portland 14, Oregon

By EDWIN BREMER

Foundry DEVELOPMENTS

INTERESTING development is a forthcoming investigation to determine the practicability of casting entire airplane wings of magnesium alloy. Commissioned by the U. S. Air Force to find the answer, Northrop Aircraft Inc., Hawthorne, Calif., working in conjunction with foundries specializing in the light-metal field plans to cast the outer half of an aircraft wing in one piece. That will be tested to determine its characteristics and compare them with an identical wing made from aluminum sheet and extrusions by conventional fabrication methods. Proponents of cast magnesium wings claim this method of manufacture would have great advantages in event of a national emergency. Supply of magnesium extracted from seawater is almost limitless. In addition they point out, foundry facilities and personnel can be expanded much more rapidly than can facilities for producing aluminum extrusions and forgings. Much saving in time and equipment would occur in actual fabrication of cast structures as compared to the conventional riveted airplane structures.

* * *

CO-DEVELOPED by Milton M. Leven and Herbert F. Minter of Westinghouse Research Laboratories, Pittsburgh, a new stress sensitive or "photo" plastic can be cast in cylindrical or rectangular pieces 8 in. in diam or in width and 36 in. long. Three-dimensional scale models cut from the plastic are subjected to stresses and examined under polarized to determine the stress patterns and their magnitude. New plastic is a modified form of Fosterite a tough, waterproof material developed by Westinghouse scientists during the war to seal radio and radar parts against moisture. Material is said to be 35 per cent more sensitive to stresses than other photoplastics.

* * *

RELATIVELY new field of technology is application of liquid metals as heat transfer agents. Since their boiling points are considerably higher than that of water, liquid metals can be used at higher temperatures without a pressurized system. To augment information available on the subject a 194-page *Liquid Metals Handbook* has just been published under the joint sponsorship of the Atomic Energy Commission, Office of Naval Research and Navy Bureau of Ships. Much of the information compiled in the handbook was obtained during the past few years from research sponsored by AEC and the two Navy agencies although private industrial laboratories also have contributed. Metals discussed include aluminum, antimony, bismuth, cadmium, cesium, gallium, indium, lead, lithium, magnesium, mercury, potassium, rubidium, sodium, thallium, tin, zinc, and several alloys. Copies of the handbook may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, for $1.25.

* * *

IMPROVED magnetic permeameter for the precise testing of magnetic materials at magnetizing forces up to 300 oersteds has been developed by R. L. Sanford and P. H. Winter of the National Bureau of Standards. The new instrument, known as the MH (medium magnetizing force), permeameter, is absolute in principle—that is, its constants are derived from its own dimensions so that calibration by reference to any other permeameter is not required. At the same time, it is as simple and convenient to operate as any of the commercial permeameters now in general use in industrial laboratories.

* * *

IMPROVED precision thermostat developed by Dr. William R. Eubank at the National Bureau of Standards, Washington, provides smooth continuous control of an electric furnace within a very small range at temperatures between 1000 and 1550° C. Device is of the type in which the furnace winding itself serves as the sensitive element, forming part of a bridge circuit for control of a thyratron tube. The thyratron circuit then acts as a continuously variable valve, allowing just enough current to reach the furnace to compensate for a given temperature fluctuation. New thermostat is highly sensitive and independent of normal fluctuations in line voltage. As it is convenient to operate, easily adjusted for any temperature, and reliable for periods of continuous operation from a few minutes to several days, it should provide a useful tool in such fields as metallurgy, ceramics, glass technology, and cement chemistry, where automatic control of furnace temperature has long been a problem.

* * *

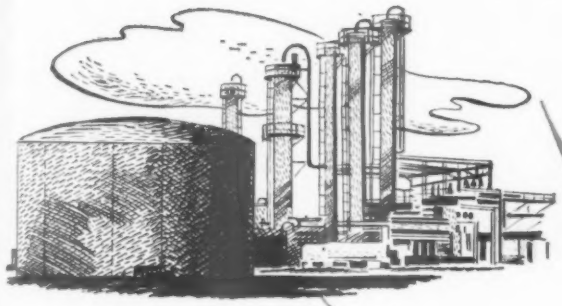
SOMEWHAT unusual cause resulting in a defective batch of castings recently was described in our British contemporary, *Metal Industry* (London). In the casting a core originally was tied down through the drag with iron or steel wire. However, due to a shortage of that material, copper wire was used and the combined effect of up-thrust of liquid metal and heat stretched the copper wire enough to permit the core to rise sufficiently so that metal entered the core print and plugged the vent. When iron wire again was used no further trouble was encountered.

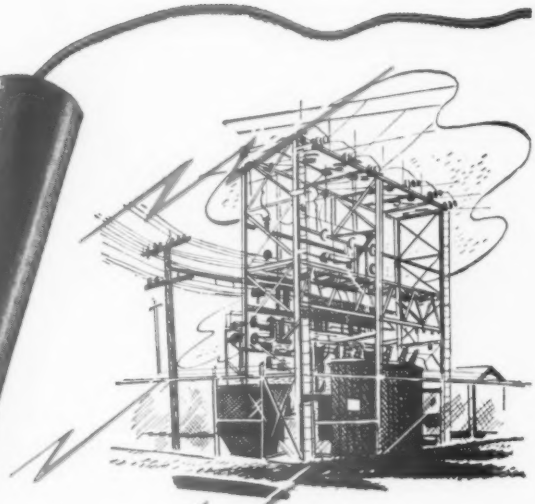
* * *

NOW AVAILABLE for distribution the 1948 *Minerals Yearbook* compiled annually by the Bureau of Mines, comprises an authoritative source of factual information on both domestic and foreign mineral commodities. It contains 1626 pages of economic and statistical data which review the production, distribution and consumption of all mineral commodities including fuels. A review and statistical summary of mineral production are presented and employment and injuries in the mineral industries in 1948 are discussed. Bound copies of the volume may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, for $4.25.

* * *

NATIONAL Bureau of Standards recently has published a comprehensive 72-page circular giving information on the properties of nickel and nickel alloys. Circular 485 is titled *Nickel and Its Alloys*, and copies may be secured from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, for 50 cents each.





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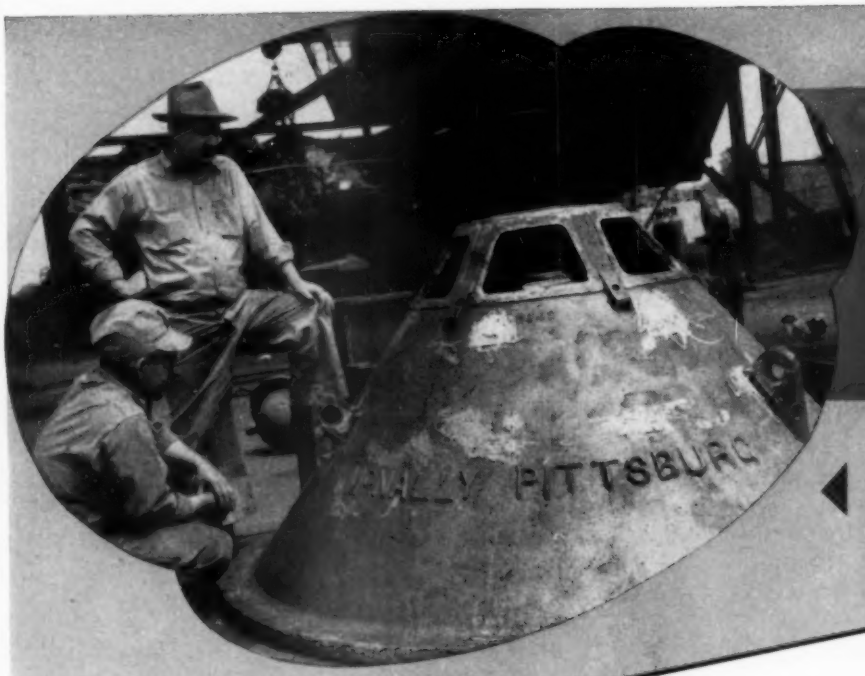
NO METAL CAN TO LEAK OR CORRODE



Fast, Safe Se

TRAMRAIL at M

A heavy centrifugal dryer casting being inspected by General Superintendent H. T. Hendricks and Heavy Floor Foreman L. L. Boone. This piece weighs 3620 lbs. Castings weighing from two oz. to 5300 lbs. are produced at McNally Pittsburgh.

McNally Pittsburg Foundries, Inc.

FOUNDERS OF PROCESS & ALLOY CAST IRON

Pittsburg, Kansas

Engineering Division
THE CLEVELAND CRANE & ENGINEERING CO.
Wickliffe
Ohio

Gentlemen:

We have your query about our present Cleveland Tramrail system. As you know, Tramrail was selected to service our three machine molding floors and the core department when this Foundry was built in 1945. Electric hoists are used.

The requirements were unusual. The machine floors handle a wide variety of work, calling for two to three types of metal during the day. Furthermore, the metal is scheduled on a semi-continuous basis, split into two separate heats. In addition, heavy flasks must be delivered to pouring conveyors and poured flasks must be delivered to the shakeout while the pouring cycle is proceeding.

This requires maximum flexibility in serving the floors with flasks, cores and metal; which was the determining factor in selecting Tramrail.

In our opinion, the experience over the past years has amply proven the success of your original recommendations. We feel that Tramrail is the most efficient and economical system for handling such a diversity of service demands.

Cordially,

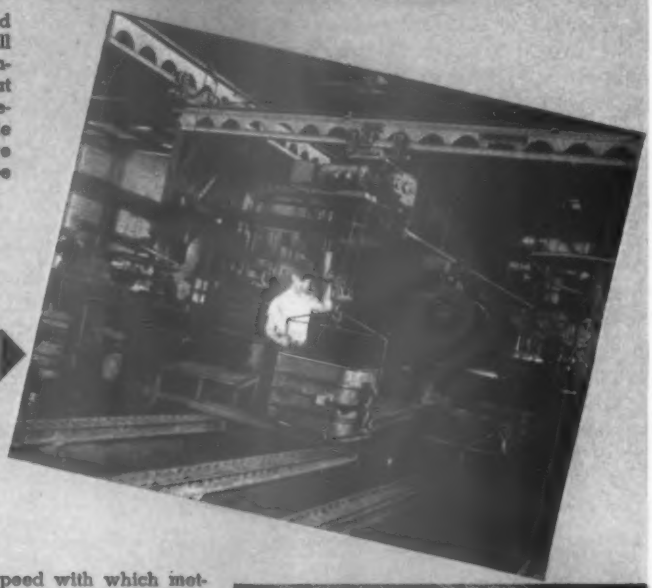
H. T. Hendricks
Superintendent

HTHendricks
trc

GENERAL OFFICES & FOUNDRY, PITTSBURG, KANSAS SUBSIDIARY OF THE MCNALLY PITTSBURG MFG. CORP. PITTSBURG, KANSAS
SALES OFFICES CHICAGO, ILLINOIS PITTSBURGH, PENNSYLVANIA WELLSTON, OHIO
ALL CONTRACTS AND SHIPMENTS ARE SUBJECT TO STRIKES, FIRES, ACCIDENTS AND OTHER CAUSES BEYOND OUR CONTROL

Service PROVIDED BY CLEVELAND
McNALLY PITTSBURG FOUNDRIES

The core room foreman and one core man can handle all cores with a Cleveland Tramrail bridge and hoist that travels the length of the core-making floor. Considerable time would be lost if the large volume of cores had to be hand-lifted.



Flasks are easily closed by use of the Tramrail equipment and moved to correct pouring conveyor with minimum lost motion.

The speed with which metal can be handled demonstrates the efficiency of Cleveland Tramrail equipment and the time that can be saved through its use. Ladles leave the cupola in order poured and go directly to pouring stations on three floors without waiting for other ladles.

Pouring the medium floor with an average of 11,000 lbs. per day, the Cleveland Tramrail equipment has proven fast, flexible and safe. This bridge is reserved for this ladle. An average of 139 molds are poured per day.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

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THE CLEVELAND CRANE & ENGINEERING CO.
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CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Activities of Foundry GROUPS

Wisconsin

FIRST fall meeting of Wisconsin Chapter of the AFS was held at Hotel Schroeder, Milwaukee, on Sept. 8. Chapter President W. W. Edens, Badger Brass & Aluminum Foundry Co., Milwaukee, announced that the Milwaukee Chapter of the American Society for Metals had invited AFS members to its next meeting.

Four sectional meetings comprised the program. The malleable group had as its speaker C. H. Behen, Metallizing Co. of America, whose topic was "Casting Reclamation." The questions which followed the talk were concerned with dot welding and a new process for impregnating castings having cracks or other defects.

Gray iron foundrymen and patternmakers joined to hear George Cannon, Muskegon, Mich., talk on "Patterns and Castings in the Jobbing and Production Foundry."

A. L. Pace of the industrial x-ray section, General Electric X-Ray Corp., Milwaukee, talked on "X-Ray Techniques and Interpretations."

The steel group discussed "Chemical and Physical Reactions of Mold and Core Washes for Steel Castings," with J. A. Gitzen, Delta Oil Products Co., Milwaukee, as chairman.—*John E. Hubel.*

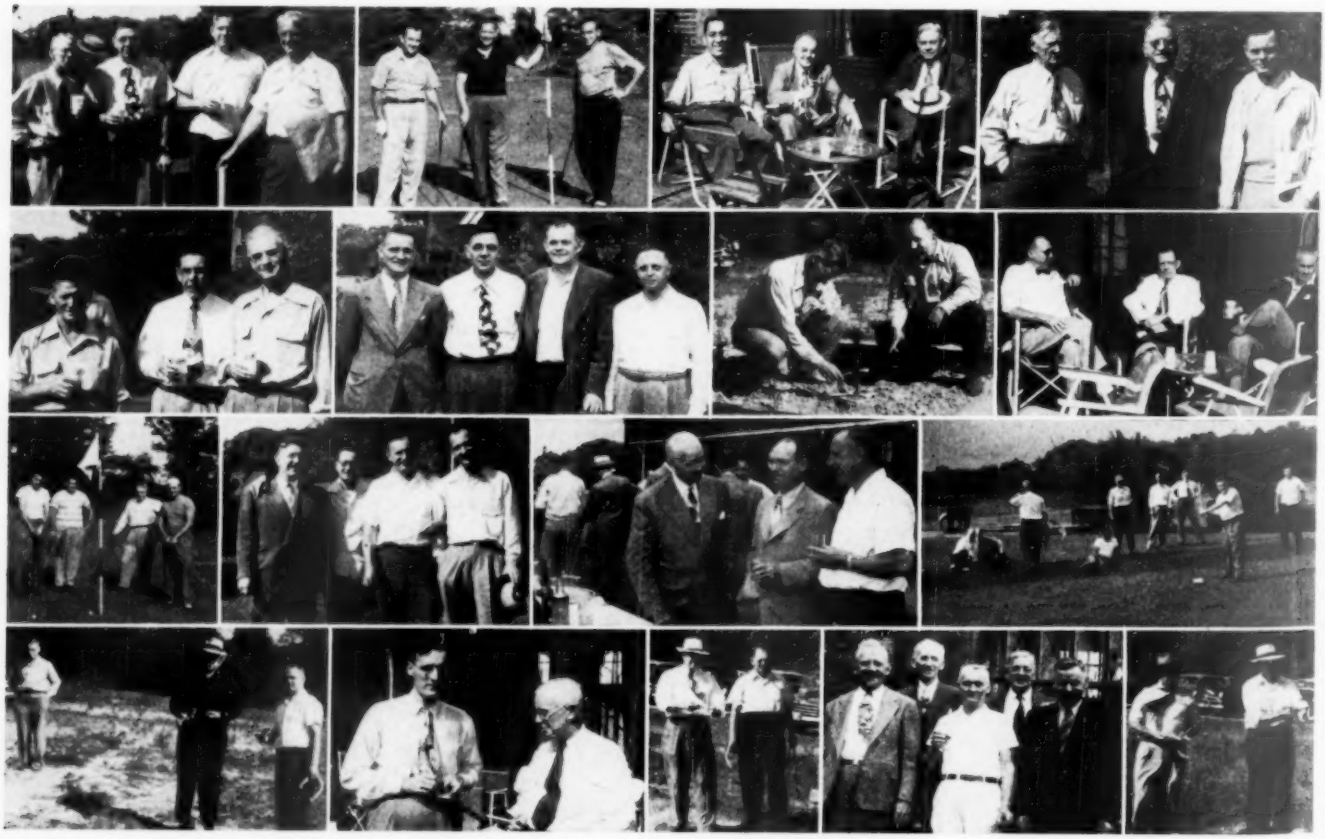
Chicago

APPROXIMATELY 900 members and guests of Chicago Chapter of the AFS were on hand for that group's annual outing held Aug. 12 at Lincolnshire Country Club, Crete, Ill. A golf tournament was the featured attraction and a full afternoon of entertainment was provided for the non-golfers. Horseshoe pitching attracted many participants and spectators. Before the afternoon ended each foundryman had an opportunity to guess the weight of a group of castings, guesses ranging from 200 to 1000 pounds. The winner was Doyle Sweet whose guess was within one pound of the correct weight—532.14 pounds.

A chicken dinner was served, followed by an entertainment program.

Arrangement and direction of the outing was by the chapter's entertainment committee. Chairman for the third year was Robert M. Jones, superintendent of foundries, South Works, Carnegie-Illinois Steel Corp., while secretary of many years' service was Harry E. Cullen, director of recreation of the same company. Other committee members were: John J. Behan, National Carbon Co.; George J. Biddle, Illinois Clay Products Co., the chapter's secretary-treasurer; R. H. Burnell, Federal Foundry Supply So.; F. B. Flynn, S.

(*Continued on page* 156)



NORTHEASTERN OHIO Chapter of the AFS held its annual summer outing June 30 at Lake Forest Country Club. Golf, horseshoe pitching, boating and a softball game between foundrymen and vendors were on the program. The vendors won, 35 to 27. Photos by Sterling N. Farmer, Sand Products Corp.

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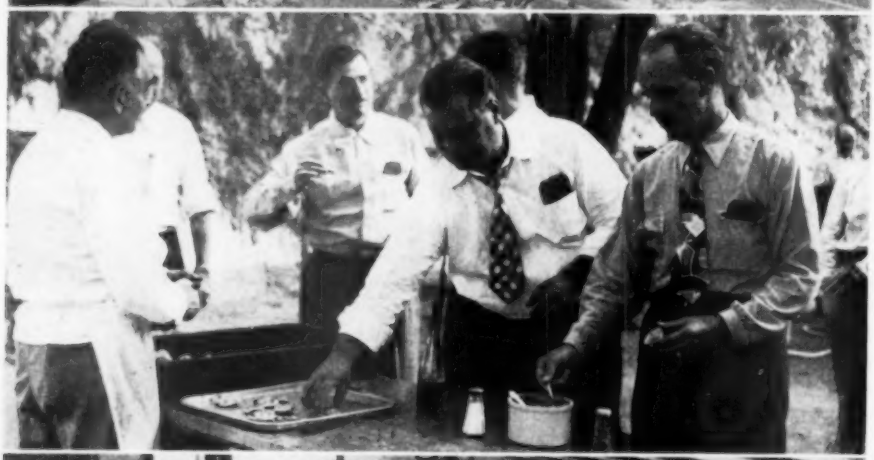


CENTRAL NEW YORK Chapter of the AFS held its annual outing June 16 at Hinerwadel's Grove, Syracuse, N. Y., with 175 foundrymen and guests attending

(*Continued from page* 154)

Obermayer Co.; J. C. Gore, Werner G. Smith Division, Archer-Daniels-Midland Co.; C. C. Kawin, Charles C. Kawin Co.; T. J. Magnuson, J. S. McCormick Co.; S. E. McGinty, Firegan Sales Co.; N. L. Mooneyham, Kordell Industries Inc.; H. J. Pfeifer, Electro Metallurgical Sales Corp.; E. C. Reimann, Wisconsin Steel Co.; H. G. Slichter, Beardsley & Piper Co.; E. W. Smith, Western Materials Co.; H. C. Swanson, Arrow Pattern & Foundry Co.; and H. K. Swanson, Swanson Pattern & Model Works—*I. H. Dennen, Beardsley & Piper Co.*

Northern California

TO SERVE the Northern California Chapter of the AFS during the current season, the following committee chairmen have been appointed: Elgo Sabatini, General Metals Corp., Oakland, Calif., finance; Ed. Rowe, Balfour-Guthrie Co., San Francisco, membership; J. M. Snyder, Jos. Musto Sons-Keenan Co., San Francisco, public relations, James Francis, Vulcan Steel Foundry Co., Oakland, advisory; W. S. Gibbons, Ridge Foundry Co., San Leandro, Calif., educational; Roy Hoag, General Metals Corp., attendance; E. H. Brumley, Brumley-Donaldson Co., Oakland, entertainment. The chapter's apprentice training committee includes: R. C. Noah, San Francisco Iron Foundry, San Francisco; W. S. Gibbons, Ridge Foundry Co., San Leandro.—*J. M. Snyder, Jos. Musto Sons-Keenan Co.*

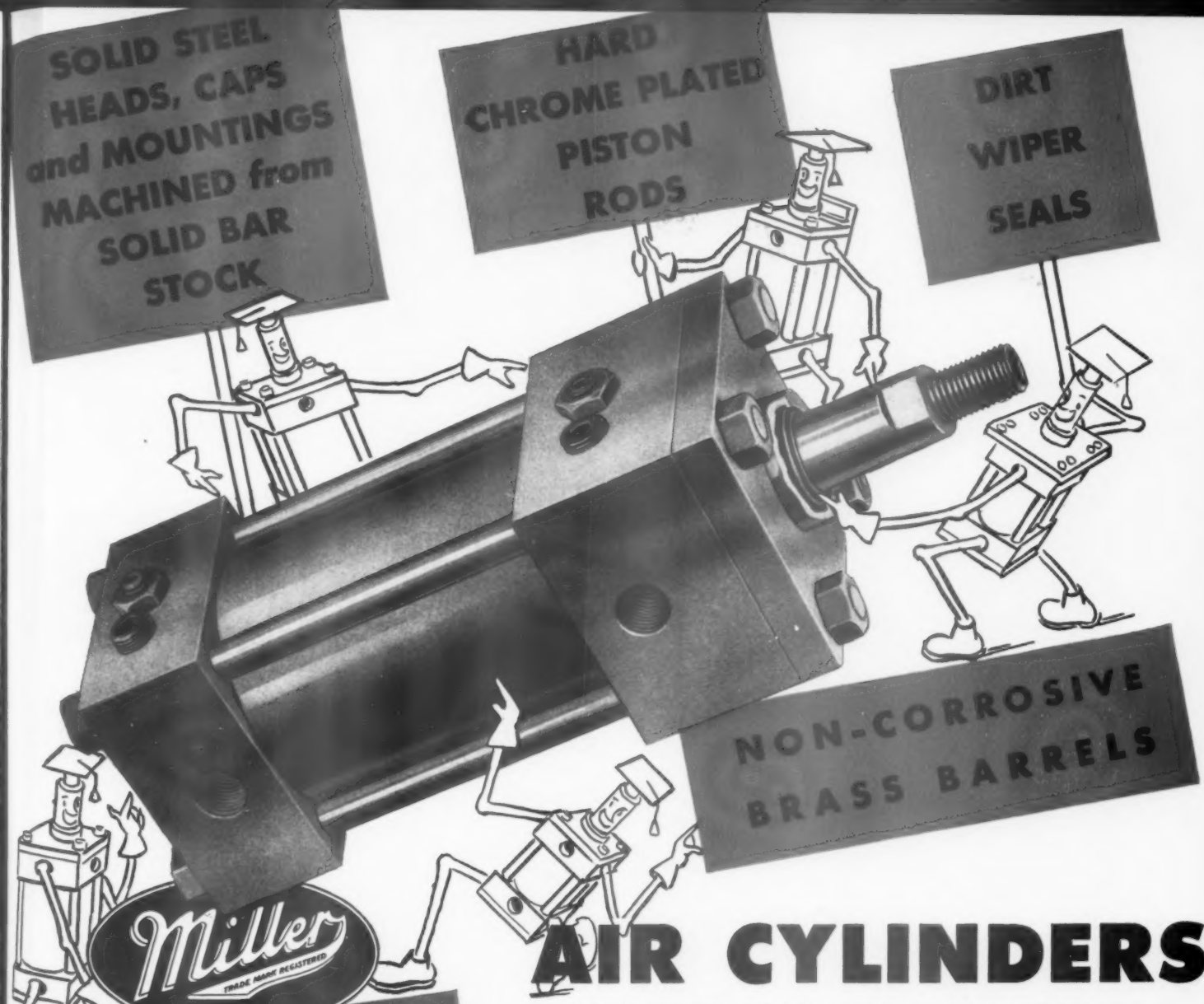
Twin City

FIFTH annual golf outing of Twin City Chapter of the AFS was held July 31 at Midland Hills Country Club. More than 180 members and guests enjoyed the afternoon of golf and an evening of good food and fun. The success of the outing can be attributed to a hard working committee headed by T. H. Palmer, Fire Brick Supply Co., Minneapolis. Group singing before and during the dinner hour was accompanied by Kathy with her accordian. After dinner many valuable prizes were raffled off. Highlight of the afternoon on the golf course was a drenching thundershower that caught most of the golfers with their raincoats at home.—*J. D. Johnson, Archer-Daniels-Midland Co.*

Safety Principles

The committee on labor-management co-operation for safety of the President's Conference on Industrial Safety, U. S. Department of Labor, Washington, has approved a set of principles governing labor-manage-

(*Continued on page* 159)


SOLID STEEL HEADS, CAPS and MOUNTINGS MACHINED from SOLID BAR STOCK
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SOLID STEEL HEADS, CAPS and MOUNTINGS. **Eliminate dangerous, costly breakage under even the severest operating conditions . . . assuring longest possible cylinder life. Standard construction on ALL Miller Cylinders—*both Air and Hydraulic.***

HARD CHROME PLATED PISTON RODS. **90,000 to 110,000 psi yield point heat treated stress relieved steel, accurately ground, polished, then hard chrome plated for extra high resistance to the scratches that commonly cause leakage.**

DIRT WIPERS. **Wipe piston rods clean on every "in" stroke, protecting piston rods, seals, and bushings from scratch-damage by dirt, scum, abrasive particles. Standard construction on ALL Miller Cylinders — *both Air and Hydraulic.***

NON-CORROSIVE BRASS BARRELS. **Eliminate the rust and corrosion caused by moisture always prevalent in plant air lines. Standard construction on all Miller Air Cylinders.**

Benefits to You

No Broken Castings
No Scratch-Damage to Piston Rods, Bushings and Seals
NO COSTLY "DOWNTIME"
NO REPAIRS
NO MAINTENANCE
NO POWER WASTAGE

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ST. LOUIS and OTHER AREAS.

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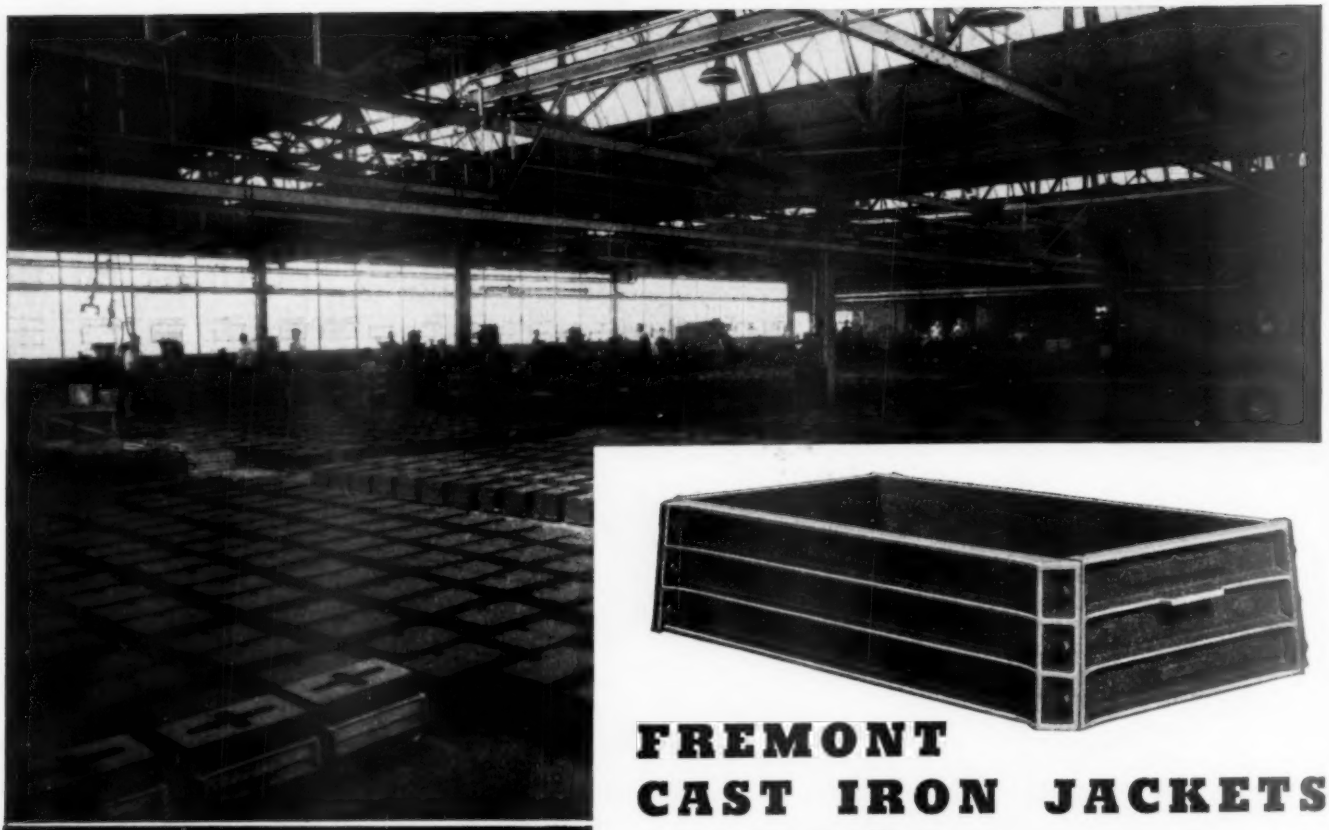
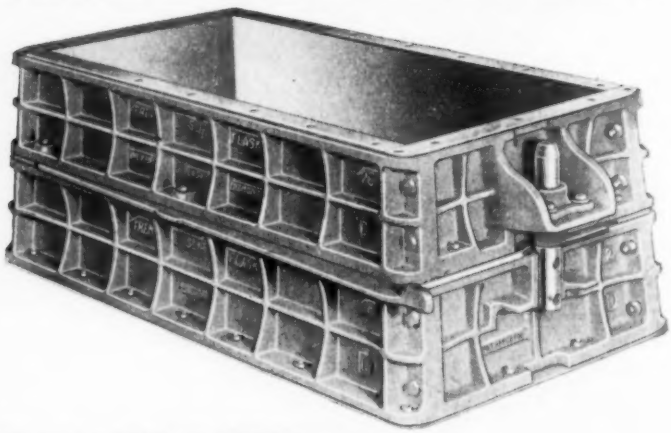


Wells Mfg. Co.'s new foundry in Skokie, Ill. Its 28,800 sq. ft. of floor is well covered by Fremont cast iron jackets and magnesium flasks. They're standard equipment.

FREMONT
CAST IRON JACKETS



FREMONT
MAGNESIUM FLASKS

BUILT FOR LONG SERVICE & FAST PRODUCTION

ALL ORDERS GIVEN VERY PROMPT ATTENTION

GROOVLOCK
THE FOOL-PROOF PIN

THE FREMONT FLASK CO.
Fremont, Ohio

(*Continued from page* 156)
ment co-operation in attempting to reduce deaths and accidents in industry.

Briefly the principles state that safety primarily is the legal and moral obligation of the employer and further that co-operation in the safety program is the moral obligation of each individual employee and the labor union.

Copies of the principles are available from the President's Conference on Industrial Safety.

ASTM To Study Air Pollution

American Society for Testing Materials will form a new technical committee on sampling and analysis of atmospheric pollution. Dr. Louis C. McCabe, chief of air and stream pollution, U. S. Bureau of Mines, will be temporary chairman. Committee members will include representatives of industry, government agencies, and others concerned. The group will work on developing acceptable standard tests and analytical methods for measuring air contaminants.

Non-Ferrous Society To Meet Oct. 13-14

Annual meeting of the Non-Ferrous Founders' Society will be held at the Statler Hotel, Boston, Friday and Saturday, Oct. 13-14. Final meeting of the 1949-50 board of directors will be held on Friday.

Program of the membership meeting which will be held on Saturday, will include reports of officers and committees during the morning session. At the luncheon meeting there will be an address by a member of the Munitions Board concerning procurement and co-operation with the industry. The afternoon session will include a discussion of governmental controls and procedure by a qualified government official. There will also be a report and discussion of business practices and a long-range cost program to tie in with the new regulations.

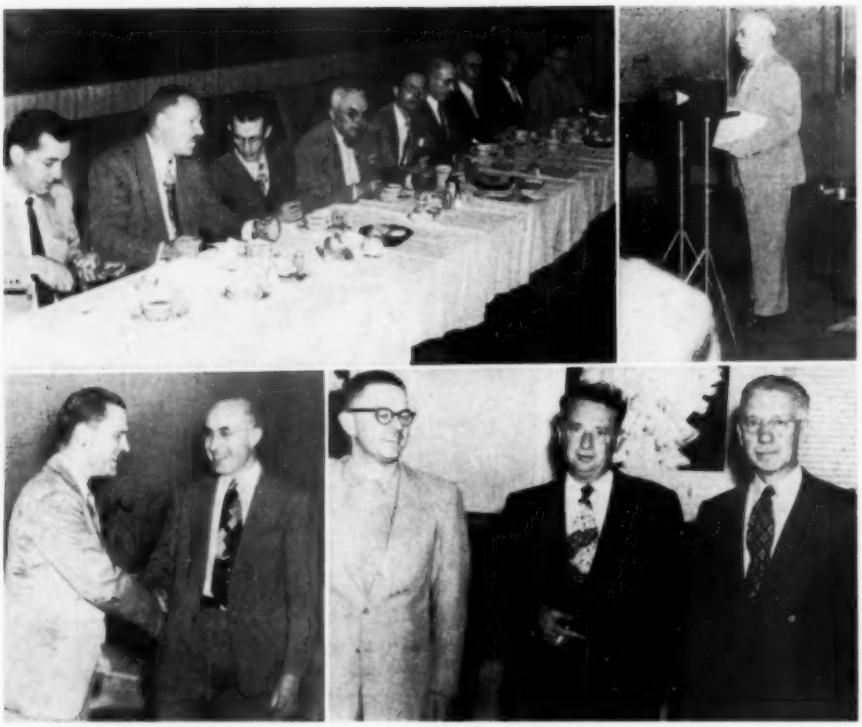
Annual dinner for members, wives and guests will be held Saturday evening.

SOUTHERN CALIFORNIA Chapter of the AFS at its June 9 meeting displayed patterns and castings made by winners in the apprentice pattern and casting contest. James J. Eppley, Axelson Mfg. Co., Los Angeles, past chapter president, shown in center with clasped hands, discussed merits of the winning pieces

Panels Show Use Of Steel Castings

As part of its expanded information and educational services, Steel Founders' Society of America, Cleveland, has developed 11 portable display panels to convey basic information on steel castings to student and faculty groups in their own classrooms and lecture halls. Dramatizing the subject by use of color, animation and illumination, the 4 x 6-ft panels operate electrically. Sequential kodachrome picture combinations feature typical steel cast-

CENTRAL ILLINOIS Chapter of the AFS held a clambake at the 40 and 8 Chateau near East Peoria, Ill., June 10. Shown at left, standing, is Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill. Seated, left to right, are: T. Spencer, Caterpillar, and A. L. Lamasters and D. Dennison, Alloy Engineering & Casting Co., Champaign, Ill. At right, left to right, are: C. W. Russell, Caterpillar, Bon Spengler and Jim Smith, Annex Pattern Co., Detroit, and Dewey Smith and Earl Brown, Caterpillar



EASTERN NEW YORK Chapter of the AFS met June 20 at Circle Inn, Lathams, N. Y. Above left is a view of the speakers' table. Howard W. Davenport, public relations department, New York Telephone Co., Albany, N. Y., shown at top right, was the speaker. At lower left, K. F. Echard (left), retiring chairman, welcomes Leo M. Scully, Scully Foundry & Machine Co., Coxsackie, N. Y., incoming chairman. New directors are shown at lower right. Left to right, are: Lee Martin, Northern Indiana Brass, Glens Falls, N. Y.; Newb Williams, George F. Pettinos Inc., and Scott Mackay, Rensselaer Polytechnic Institute, Troy, N. Y.

ing applications selected to meet exacting engineering and design requirements.

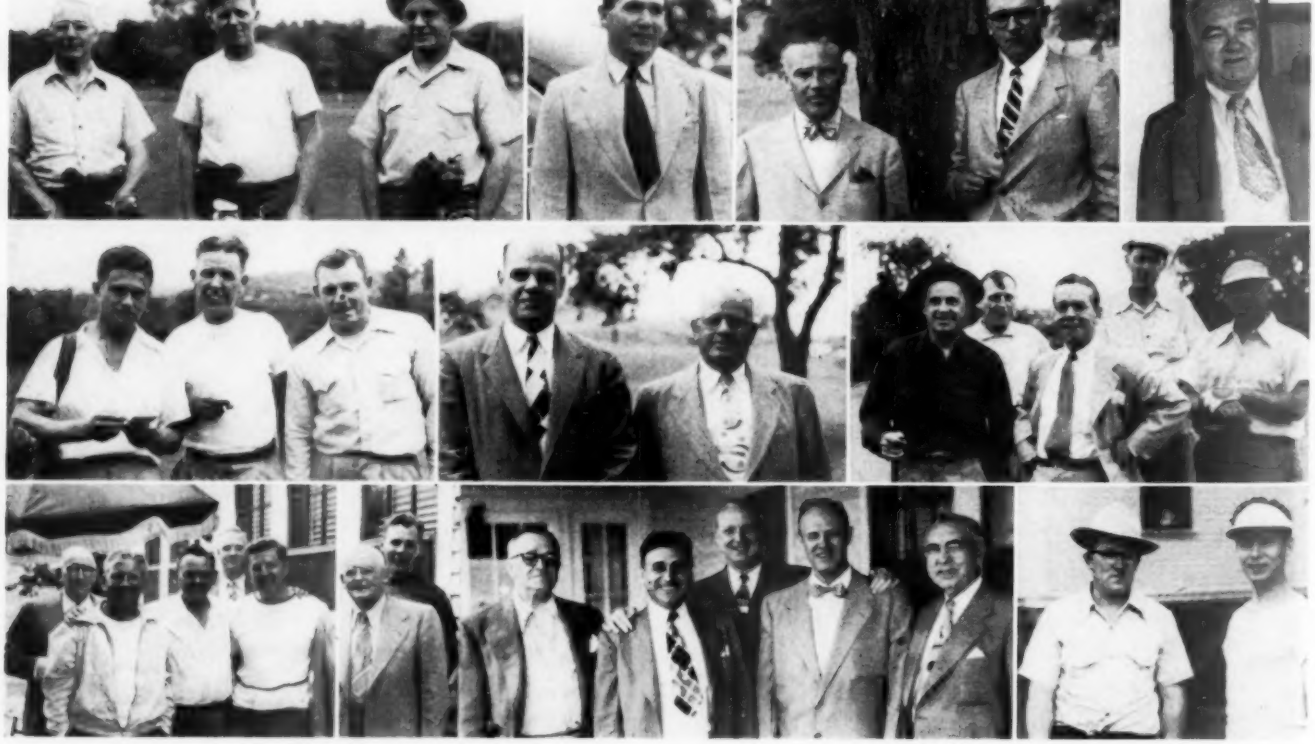
Free postcard request forms offering four society publications are made available in a box attached to each panel. The society's schedule calls for showing panels in 128 engineering colleges across the country.

Book Review

The Foreman's Manpower Job, by John E. Gagnon and R. W. Verney, cloth, 184 pages, 5¼ x 8¼ in., published by the National Foremen's Institute, New London, Conn. Price $2.50.

This is the second of a series of books dealing with management practice problems. Mr. Gagnon is manpower manager, Bigelow-Sanford Carpet Co., New York, and Mr. Verney is personnel manager, Maxwell House Division, General Foods Corp., Hoboken, N. J.

This work is divided into two sections. The first section deals with the importance of the manpower job, selection, placement and separation of workers, orientation, training, promotions, transfers, down-grading and layoffs, manpower controls, human relations and safety and welfare. The second section deals with a foreman's philosophy and his relationships with the workers, the union, and management.



NEW ENGLAND Foundrymen's Association held its summer outing June 14 at Marlborough Country Club, Marlborough, Mass. Photos furnished through courtesy of C. A. Wyatt, Debevoise-Anderson Co., Boston

VOLCLAY BENTONITE

NEWS LETTER No. 23

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

What did we do before Mullers were used?

The early molder did not have the conveniences that present molders enjoy, so he had to adopt his own ingenuity in developing suitable molding sand.

For example, each working day the molder would lay out his work. All the loose patterns would be assembled and then segregated according to size, shape and weight.

The old-timer was always careful in grouping castings that required large cope areas. He usually did this because a special sand would be required to "hold the cope" and thus greater care would have to be taken.

The old-timer realized that large flat copes would usually buckle or rattail if the sand was not properly cared for and if it was not properly rammed.

The molder would usually allow his apprentice to "walk the sand". Walking the sand meant for the apprentice to take part old heap sand and spread new sand over it and then trample over the sand until it was properly mulled with the feet. Turning by shovel repeating the operation.

This procedure helped blend the stronger new sand into the old heap sand and accomplished part of the mulling. Temper water was also equalized which was important in order to ram the sand mixture correctly.

Green Compression strength was increased, which was very important, as it required a good tensile strength to prevent the cope from sagging thus eliminating as many gaggers as possible.

The increased strength, the kneading action of the feet and the soft-medium ramming usually prevented the cope from expanding which resulted in buckling or rattailing on the flat areas of the casting.

Horse manure was usually added, but this old time mulling action of the feet usually made the difference between a good and bad casting where flat surfaces were involved.

Proper bonding clays, combined with proper mulling, have aided the molder in so many ways.

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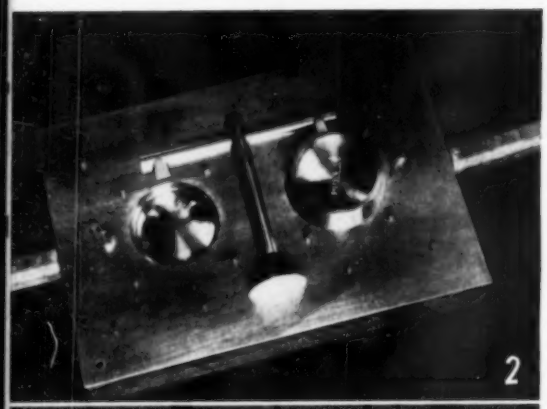

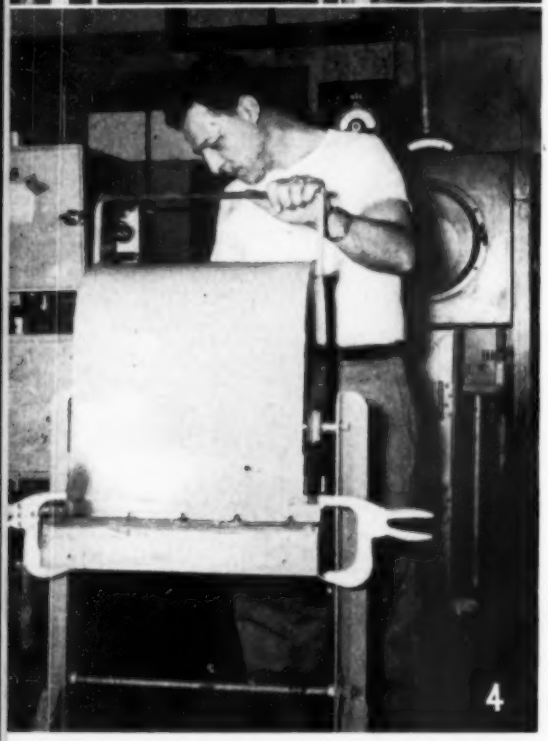

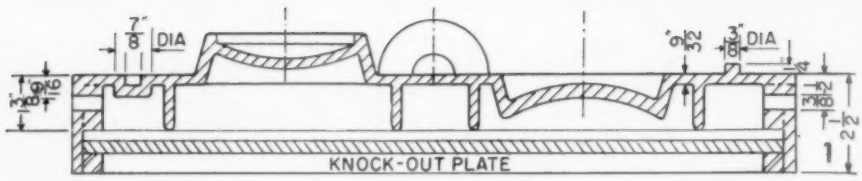

Making Shell Molds

OF RESIN AND SAND

By FRANK W. LESS
Durez Plastics & Chemicals Inc.
North Tonawanda, N. Y.

NEW method of making sand molds for metal casting, developed in Germany and known as the Croning or "C" process, involves the use of a dry mixture of sand and finely powdered phenolic resin. This mixture is dumped against a hot metal pattern for a few seconds and then baked for a few minutes to cure the resin. The mold half is then removed from the metal pattern. The mold is a thin shell about ⅛-in. thick which is quite porous, thereby allowing quick escape of the hot gases when the metal is poured. The mold halves are either clamped together or placed in a box surrounded by steel shot for reinforcement during pouring.

Both molds and hollow cores may be made in a similar manner. Such molds and cores seem particularly adaptable for use in making large quantities of castings where accurate dimensions and smooth finish are desirable. They may be used for castings up to 50 pounds weight of aluminum, brass, bronze, iron and steel.

Although actual production in this country so far has been limited, a number of concerns have done sufficient experimental work to indicate these advantages to the method:

Molds are dry and porous, resulting in quick elimination of gases and no back pressure.

Very accurate dimensions are obtained; tolerances of a few thousandths of an inch are possible.

Sections as thin as 0.010-in. can be cast accurately.

Very smooth surfaces can be obtained.

Cleaning is minimized and considerable machining is eliminated.

Inexpensive equipment is used in making the molds.

Unskilled labor may be used for making the precision molds.

Molds have no affinity for water and hence may be stored indefinitely.

Cores being hollow and dry allow quick escape of gases and collapse readily.

A large number of castings per unit of floor space can be poured at one time because molds are small and are poured in upright position.

Pattern—The pattern should be made of gray iron with a smooth finish. It should be hollow with a uniform section of about 9/16-in. The plate on which the pattern is mounted should also be of cast iron with a uniform 9/16-in. thickness. The plate should contain knock-out pins preferably mounted on a push plate for removal of the cured mold. A very smooth surface on the plate is important for easy removal of the mold. The uniform thickness of metal is necessary for uniform heating and conducting of heat to the resin-sand mix to build up a mold of uniform thickness. Gates and runners should be mounted permanently along with the half pattern on the plate. The accompanying sketch (Fig. 1) illustrates a suitable design. Core-boxes should also be made of gray iron with a 9/16-in. uniform section.

It is necessary to lubricate the patterns to prevent sticking of the resin-sand mold. A dilute solution of silicone mold release fluid is suitable.

(*Continued on page* 164)

Fig. 1—Cross section of experimental pattern showing knock-out plate. Knockout pins are apparent in Fig. 2, a view of the same pattern

Fig. 3—Experimental laboratory dump box with heated pattern ready for clamping

Fig. 4—Inverting the box allows the sand-resin mixture to drop onto pattern

Radiograph showing how the oil passage walls could be checked without damage to the casting.

Cutaway showing oil passage which required accurate and uniformly thick walls.

Only Radiography could check this vital specification

THIS sand cast aluminum housing for a high-altitude air pump included passages to carry oil at very high pressures. Specifications called for passage walls of accurate and uniform thickness.

There was one way to check this important specification—one sure way for the foundry to be absolutely certain of releasing only sound and satisfactory castings. Radiographic inspection was the way.

Radiography is becoming more and more routine with foundries assigned important tasks. On critical castings, such as this, it may be used to assure freedom from core shifts immediately before pouring and as a final casting inspection tool. Most valuable of all, radiography reveals internal defects during the pilot casting stage and suggests the changes needed to assure high yield in the production run.

* * *

Ask your X-ray dealer to explain the many ways radiography can increase your yield and better your foundry operations.

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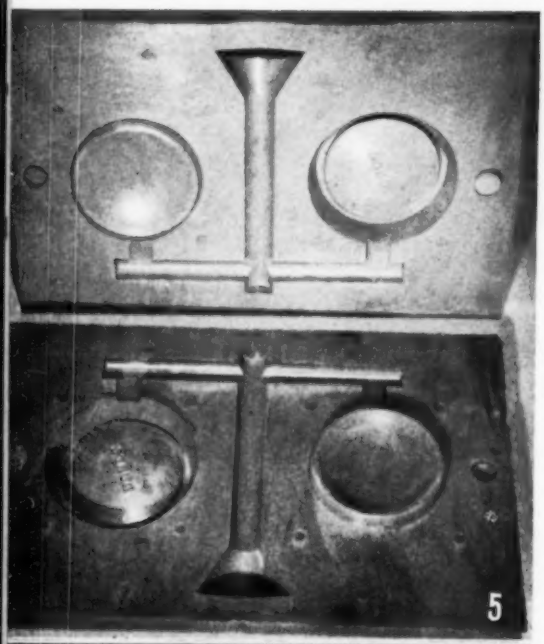

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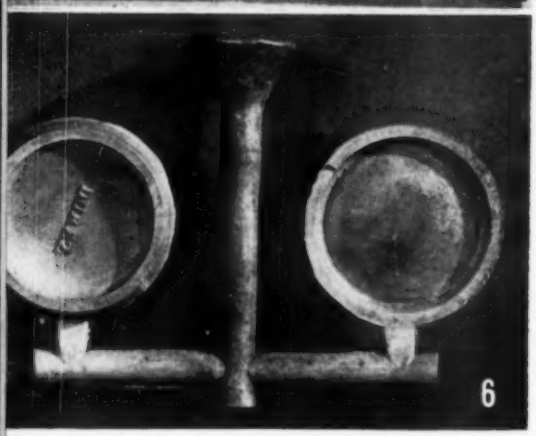

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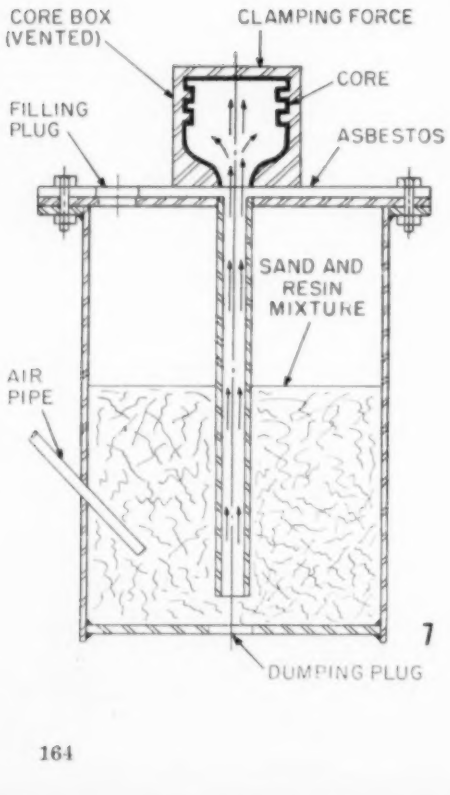

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Fig. 5—Mold halves ready for assembly and pouring. The resulting bronze casting before cleaning is shown in Fig. 6

Fig. 7 — Type of equipment adapted to blowing hollow cores from a resin-sand mix

(*Continued from page* 162)

It should be sprayed on the cold pattern and then applied to the hot pattern at intervals as may be necessary. A satisfactory product packed in a spray can is Bomb-Lube mold lubricant, made by Price-Driscoll Corp., 366 Madison Ave., New York 17.

Mixer—A conventional muller type foundry mixer may be used but a tumbling type mixer is preferred.

Dump Box—Figs. 3 and 4 illustrate a suitable dump box for holding the resin-sand mixture and bringing it in contact with the hot metal pattern. It should be arranged for quick inversion. It should be big enough to hold 40 to 80 pounds of the mix and have sufficient head space to allow the mix to fall about 1 foot before contacting the pattern. The weight of the mix and the fall insure a good contact with the hot metal pattern.

Core Blower—Cores are best made by blowing the resin-sand mix vertically up to the hot metal core box. A suitable arrangement for this is shown in Fig. 7. It includes a box for holding the mix, a pipe for the compressed air, a plug for loading and a clamping device for the corebox. Air pressure of 30 psi is suitable. When pressure is applied some of the mix is blown against the hot core box and the resin fluxes and bonds the sand. Length of time the pressure is applied determines the thickness built up. When pressure is released the excess mix drops to the bottom of the box.

Oven—A gas-fired oven is desirable for quick heating of patterns and coreboxes. It should be large enough to hold several patterns of the largest size to be used. It must be capable of holding a uniform temperature of 650° F and have suitable temperature control adjustment. Baffles in the bottom to prevent overheating of any part of the plate or pattern are desirable.

Mold Materials—

Powdered resin	6 to 10 pounds
Wetting agent	¼-pound
Sand	100 pounds

Several types of satisfactory powdered resins are available. Proper choice of the resin depends on the type of mold and the metal to be poured into it. This can best be determined by trial. The wetting agent helps to make a more uniform mix and prevents segregation of sand and resin as the mix is handled and used. A special wetting agent that mixes easily and gives optimum results was developed for this purpose.

The sand should be free of clay, metal oxides, moisture, organic matter and findings. Round sand of uniform particle size is preferable. In general, fine sands such as 155-AFS may be used for bronze and aluminum, and coarser sand, such as 90 to 100-AFS, is preferable for steel as this gives greater porosity for quick elimination of gas. Finish may be improved by adding a small percentage of silica flour but too much will reduce porosity too far. The proportions of sand and resin are dependent on results desired. Higher resin content will produce a smoother and more accurate mold and casting.

Making of Molds—First prepare resin-sand mix. Mix 100 pounds of sand with ¼-pound wetting agent for 3 minutes. Then add 6 to 10 pounds powdered resin and mix thoroughly (2 to 3 minutes). Mix must be free flowing and free from lumps.

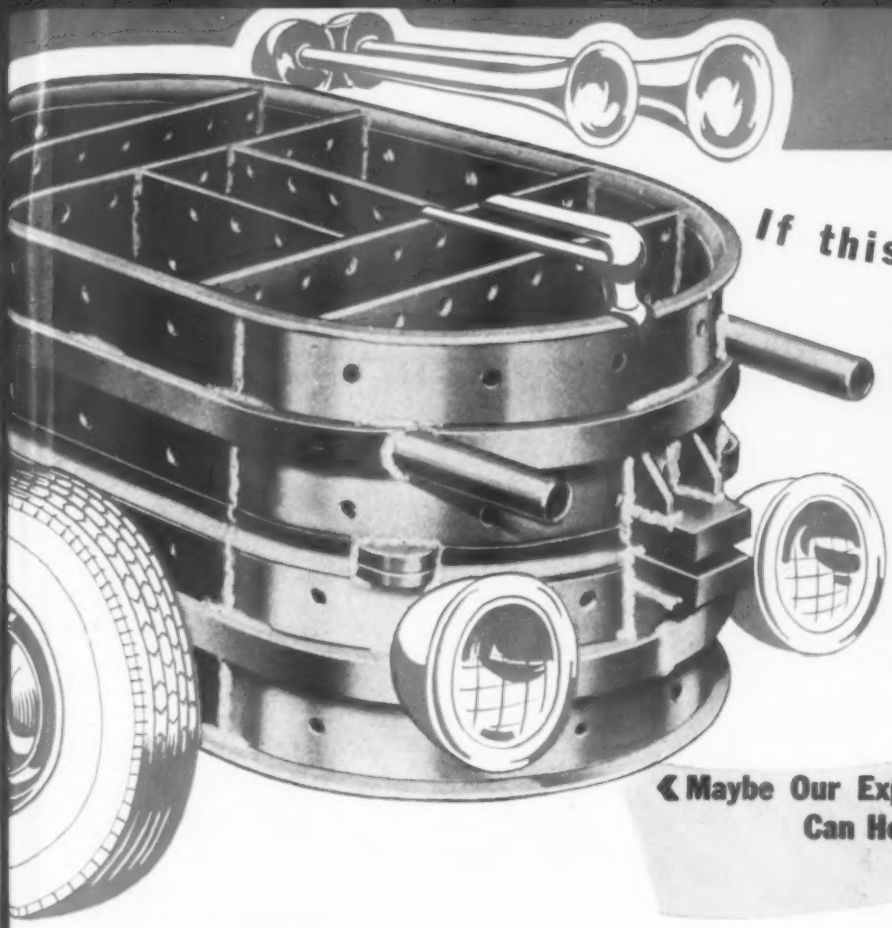
Place pattern plate in oven at 650° F until it has reached 550° F; 2 to 3 minutes should be sufficient. Tempil sticks, made to melt at definite temperatures, are useful in checking the pattern temperature.

Clamp pattern plate on top of dump box containing at least 40 pounds of resin-sand mix. Invert box quickly and allow mix to contact hot pattern until desired mold thickness is built up. The longer the contact the greater the thickness. A thickness of about ⅛-in. is generally satisfactory and if pattern is hot enough, this should build up in 3 to 6 seconds. The resin fluxes from the heat of the pattern and bonds the sand but is not thoroughly cured at this point. Next invert dump box to original position and remove pattern with mold on it. Excess resin-sand mix drops to bottom of box and is ready to use again.

Place pattern plate with mold attached in oven at 650° F for 2 to 3 minutes to cure resin and bring pattern up to temperature. Time in the oven must be sufficient to raise pattern to original temperature or build up of mold on pattern in the second cycle will not be as thick in same period of time. Indications are that it is preferable to undercure molds for use on steel and overcure those for use on bronze and aluminum for proper breakdown of the resin when the castings are poured.

Remove from pattern by pushing knock-out pins slightly. Return pins

(*Concluded on page* 168)



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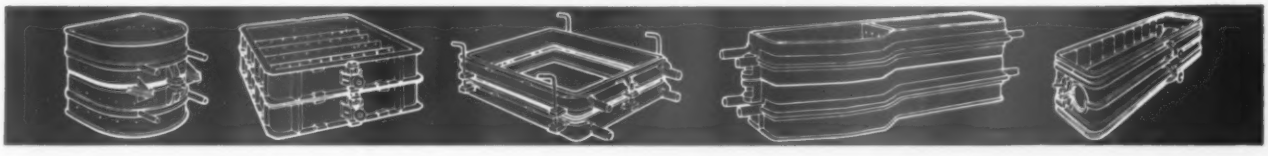

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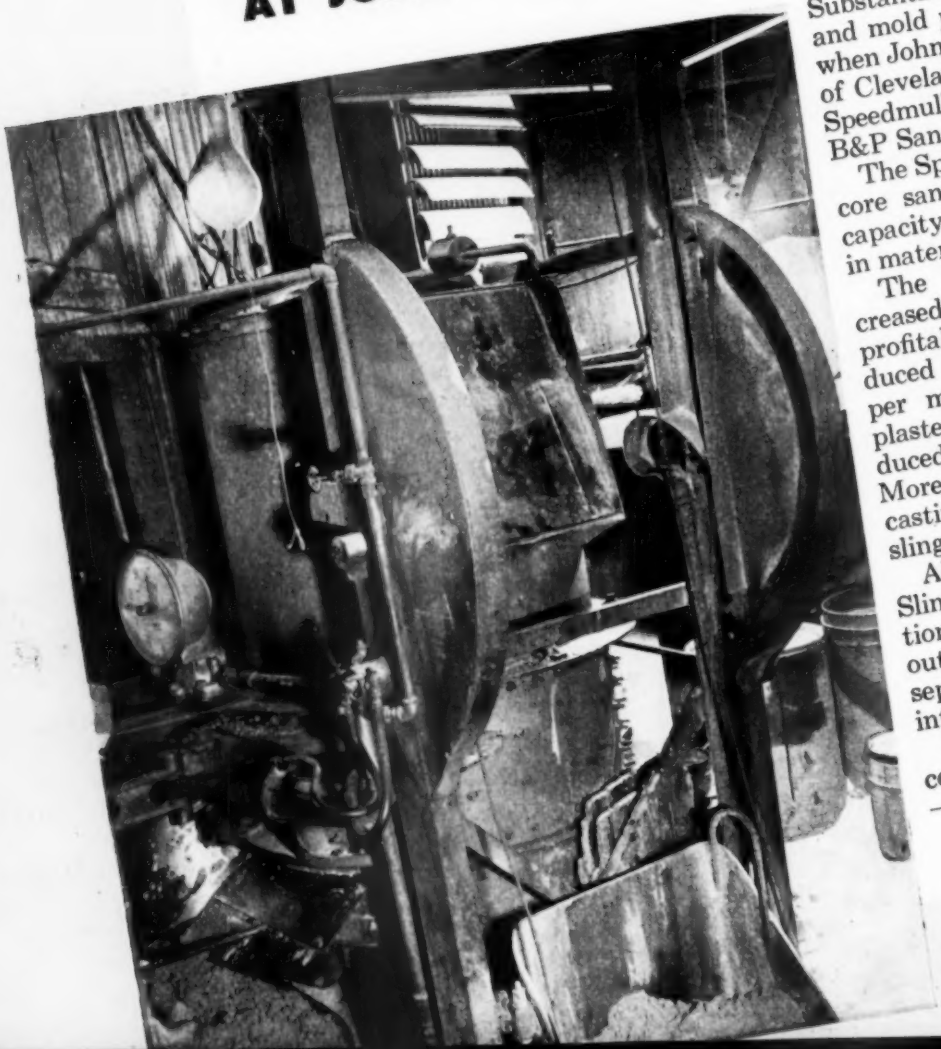

Substantial cost reductions were realized and mold production was greatly increased when John Harsch Bronze and Foundry Co., of Cleveland, Ohio, installed a Model "30" Speedmullor, a Motive Sandslinger and a B&P Sand Conditioner.

The Speedmullor provides higher quality core sand, many times the old mulling capacity, and has effected a 25% saving in materials.

The Sandslinger has appreciably increased the range of castings that may profitably be produced, and has greatly reduced the number of man-hours required per mold. Using metal, wood and even plaster patterns, the Sandslinger has reduced pattern wear and maintenance costs. More uniform molds and truer to pattern castings are additional results of Sandslinger operation.

All of the molding sand used by the Slinger is prepared by a B&P Sand Conditioner mounted below a large central shakeout. This sand is screened, magnetically separated, aerated and discharged directly into the spare tank of the Sandslinger.

Full details on the Harsch operation are contained in July-August BETTER METHODS —a copy is available on request.

Harsch replaced their paddle mixer—used for mixing core sands—with a Model "30" Speedmullor in 1944. Since installation, the Speedmullor has not been down a single day—a perfect six year performance record.

A large mold for a 575 lb. aluminum housing is rammed by the Motive Sandslinger. Harsch has found that the use of the Sandslinger lengthens pattern life—whether metal, wood or plaster patterns are used.

SPEEDMULLOR and SANDSLINGER

A B&P Sand Conditioner—mounted below the large central shakeout--screens, magnetically separates and aerates all of the molding sand used by the Motive Sandslinger. The prepared sand is discharged directly into the Slinger's spare tank.

A cope section for a large bronze casting is rammed by the Motive Sandslinger. Several of Harsch's very deep molds are rammed in flasks set in a pit at the end of the Slinger's 150-foot track.

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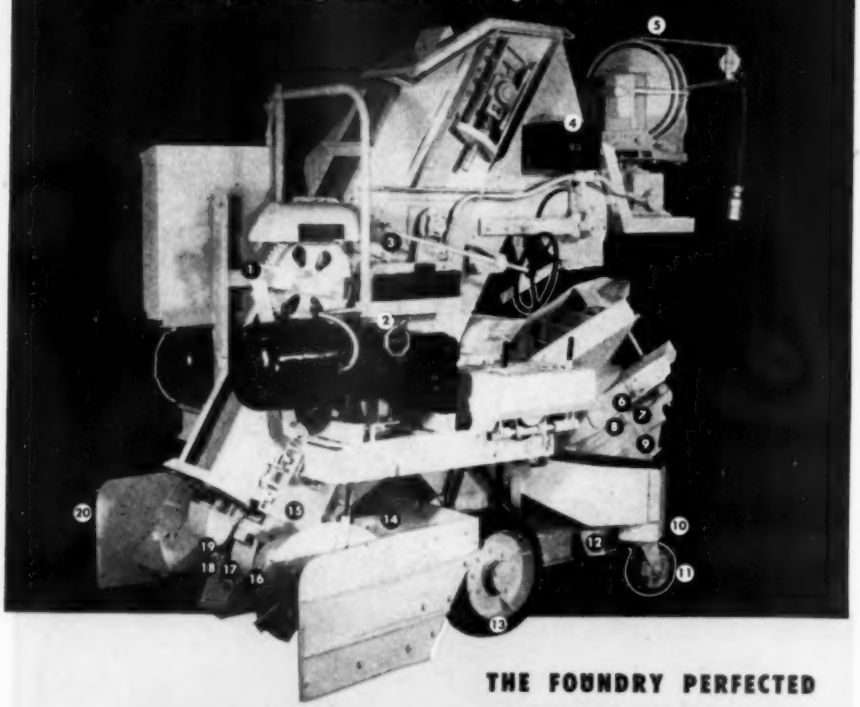

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(*Concluded from page* 164)

to original position and pattern plate is ready to clamp on dump box for a second cycle.

The two halves of the mold must be held together during the pouring of the metal. Cores are assembled in the mold in the usual way. By proper designing they may be used to assure proper alignment of the mold halves due to the accuracy of both mold and core when made by this method. For aluminum merely clamping the two halves together is generally satisfactory. For heavier metals the two halves are placed in a box surrounded by steel shot to help resist the hydrostatic pressure of the metal and help conduct the heat away from the mold. It may be necessary to paste them together, although for small castings the steel shot generally holds the two halves together satisfactorily and without the paste the parting line is less noticeable in the casting.

Pouring—The mold is poured in an upright position contrary to usual practice. The metal should run into each cavity from the bottom. Air and gases escape readily through the mold and, of course, no troublesome moisture is given off by the mold. Care should be taken to avoid turbulence of the metal during pouring to avoid sand erosion at the mold surface. The quick escape of air and gases eliminates back pressure and results in solid, dense structure comparatively free from porosity and defects. It is generally better to pour metal on the low side of the usual temperature range.

It will be understood readily that the foregoing suggestions are approximate and that each user should work out the most satisfactory procedure to suit his individual needs.

New Alloy Retards Oil, Gas Corrosion

Lebanon Steel Foundry, First Ave. & Lehman St., Lebanon, Pa., has developed a 12 per cent chromium alloy steel for castings in gas-condensate wells in the oil and gas industry where corrosion is a problem.

The corrosion resistant alloy, used in valve bodies, fittings, and similar castings required to withstand service pressures of 10,000 to 15,000 psi, is said to have a yield point ranging from 50,000 to 160,000 psi, depending on heat treatment, and a wide range of necessary mechanical properties. Field tests have shown parts cast in this alloy to have service records exceeding three years.

New Research Foundry Is Dedicated

(*Continued from page* 115)

different plants. These committees meet periodically with men at manufacturing research, to exchange ideas and plan future work.

According to Mr. McCormick, the three main objectives of this work are: 1—To improve the quality of the product; 2—To enable the company to lower the cost of its products; 3—To provide better working conditions for Harvester people. Importance of reducing the cost of castings was stressed particularly since the company uses about 475,000 tons a year. Improvement of quality will include finish and size, better control of foundry materials and processes, and higher efficiency in foundry operations.

J. W. Armour, manager of the company's manufacturing research department, stated that the dedication ceremony marked the completion of the first stage of a two-stage foundry installation. The present installation contains all the basic elements and departments necessary to carry on resarch in all phases of foundry operation. The second stage of installation now is under way and is expected to be completed next year. In the second stage the present facilities will be greatly enlarged.

Foundry Is Training Ground

Commenting on the new foundry's activities, Mr. Armour indicated that in addition to serving as a broad research center for the entire field of foundry operation, the company plans to use the foundry as a training ground for young men, most of the college graduates, to develop all-around competency as foundry supervisory and managerial people. Management believes this is one of the surest ways to provide the company with high-caliber foundry supervision for the future.

Production of gray and malleable iron castings is one of the major activities of International Harvester. Approximately 8000 people are employed in Harvester's ten gray iron and three malleable iron production foundries in the United States and Canada. Harvester's annual consumption of castings is for use in various Harvester plants making motor trucks, farm tractors, farm implements, industrial power equipment and refrigeration. Additional tonnages of castings are produced and consumed by the company in its overseas operations.

International Harvester Co.'s centralized company-wide manufactur-

(*Continued on page* 171)

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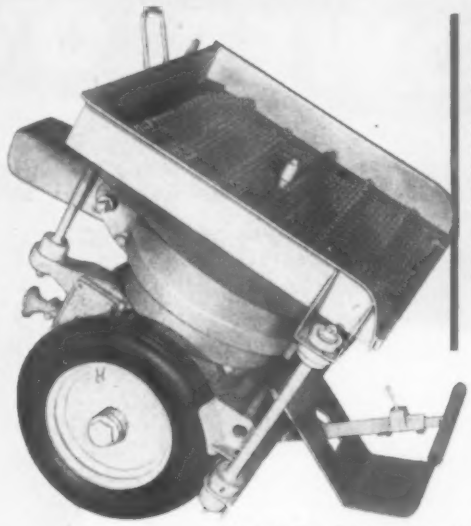

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RECUPERATIVE COOLING SYSTEM: Cores are "smoked off" and cooled before they reach the unloading station, making for better working conditions. The heat recovered from the cores is used over again, resulting in large fuel savings.

AMAZING FLOOR SAVING: Baking is done overhead, providing larger core-baking capacity in 25% of the floor space required by batch type ovens. Indirect labor savings up to 75% are secured by the elimination of racks, trucks, aisle ways and inefficient congested work areas.

PERFECT BAKING: The Coleman heating system produces perfectly baked cores with unusual speed. No rejects...no make-overs...no defective castings due to improper core baking—further increasing production.

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(*Continued from page* 169)

ing research was established in 1947. Ten major subdivisions of the research operation, called sections, have been active since that time and include in addition to the foundry: Administrative, plant engineering, mechanical engineering, materials handling and product protection, welding, metallurgical, protective finishes (paints, oil, varnishes) inspection methods, forging and manufacturing standards.

Garnet P. Phillips is general supervisor of foundry research and A. W. Anderson is assistant general supervisor, foundry research.

The first-stage foundry melting department just placed in operation contains a 1000-pound-per-hour direct-arc electric furnace with auxiliary equipment capable of producing about 4 tons of melt a day. Remainder of the foundry includes a molding sand preparation unit with various types of molding machines; core department with muller, core machines, core blower and core ovens; cleaning department with tumbling, shot blasting and grinding facilities.

A complete foundry laboratory is equipped to run tests on sands, binders and core mixtures at both room and elevated temperatures. The laboratory also has physical testing equipment for making transverse, tensile and hardness tests on metal bars and specimens.

A pattern shop for the construction of wood patterns and gating and modification of metal patterns has been provided.

The foundry is housed in the same building with ten other sections which make up the company's manufacturing research department. The foundry section will be able to utilize the services of other related manufacturing research sections in its own research work. For example, additional facilities for checking foundry products are part of the metallurgical section and include chemical, physical testing, metallographic and electrical laboratories. Special equipment available includes a million-volt x-ray machine, electron microscope, x-ray diffraction equipment, spectroscope, fatigue and impact testing equipment, and heat treat equipment. Facilities of the welding and machine shop sections also are available to the foundry research section.

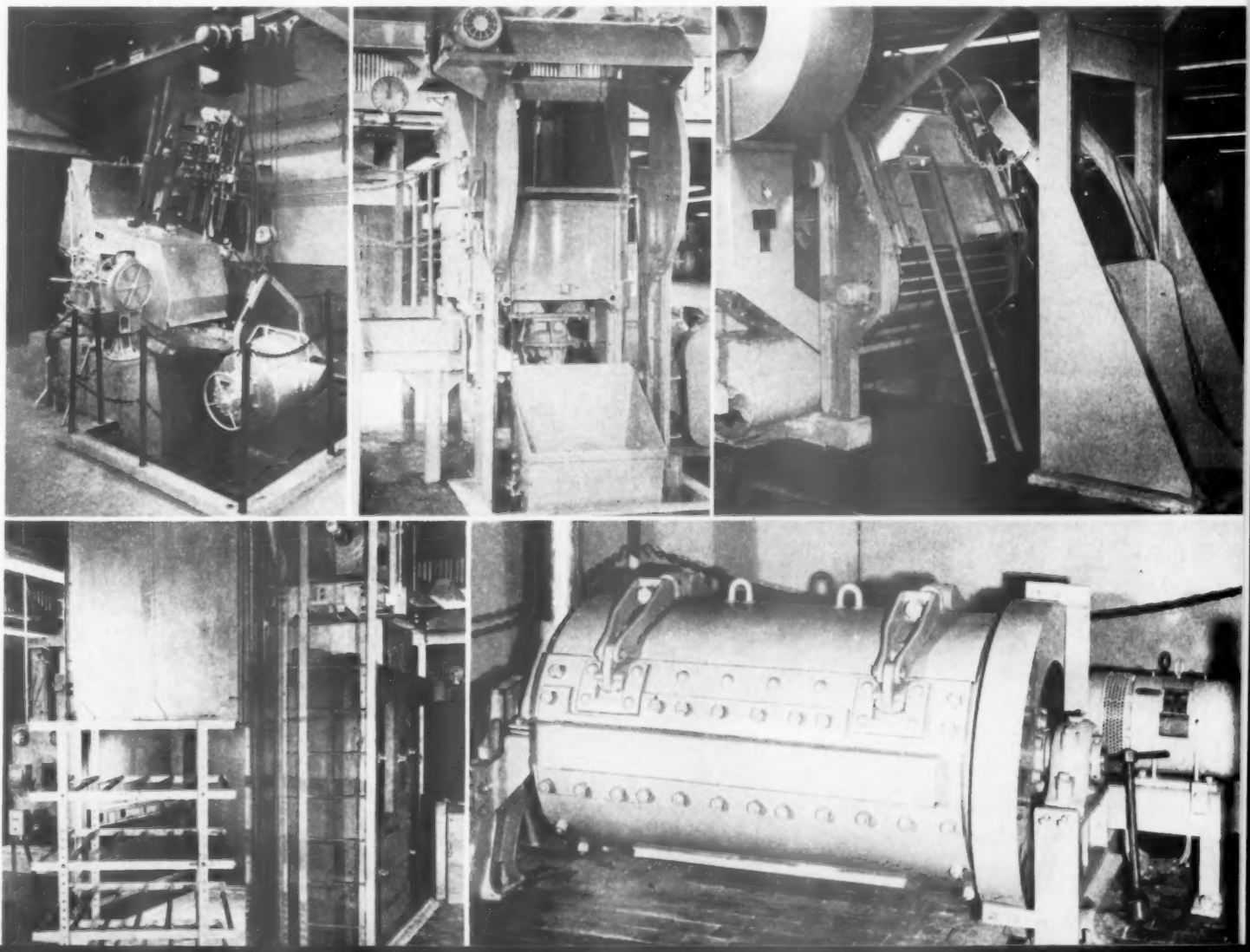
Essential differences between the first stage foundry and the second stage now being constructed are that a cupola will be added, the foundry will be completely mechanized, and the first stage equipment will be multiplied, resulting in enlargement of the foundry as a whole.

Complete mechanization of the foundry means there will be mechanical handling equipment for all raw materials, molten metal, prepared molding sand, prepared core mixes, cores, molds and castings.

The extensive exhaust system already installed in the first stage, covering all points of dust generation, will be greatly enlarged as second stage installations are completed.

When the ultimate program has been finished room will be available to install and test various types of new equipment such as molding, coremaking and cleaning equipment. There will be ample space for trying out new techniques. With the present program completed the research foundry will be equipped to produce experimental castings in practically the entire size and weight range used by the company's various operating divisions. Daily melting capacity will be about 25 tons.

Some of the major equipment units installed in the International Harvester research foundry 171



In the second stage a "closed" cupola will be added alongside the electric furnace already installed in the melting department. The cupola will be equipped with automatic air weight control, hot blast equipment, blast moisture control equipment, facilities for adding oxygen to the blast, and the latest type of dust and fume suppression equipment. The cupola will have mechanical charging with special buckets for metal and coke plus flux charges. A "water wash" type of slag disposal unit will be installed. All raw material storage for coke, flux and metals will be under cover. Charge makeup will be by crane with weight recording scales for all materials. All equipment around the cupola will have indicating and recording gages. Molten metal will be delivered to pouring areas by electric truck.

When fully completed, the molding department will have four molding floors, each served by two bridge cranes, for production of largest molds on jolt machines down to small molds made on squeezers. Mechanical shakeouts over a sand return belt will serve the four molding floors. Shakeout sand will be returned underground by belt conveyor to the sand storage and preparation unit equipped with magnetic pulley elevators, screen, storage hoppers, weigh lorry and muller. After proper preparation in the muller, the prepared sand will be elevated, aerated and delivered by belt to overhead sand hoppers at the molding stations.

The cleaning department will contain three types of shot blasting equipment—a handblast, airless blast barrel, and a revolving table type. Two tumbling mills will form part of the equipment. Stationary and portable grinding equipment will be available. All shot blasting and tumbling equipment will be served by cranes or skip hoist loaders. Space has been included in this area for annealing equipment to be used in malleable and nodular iron research.

Space reserved near the foundry laboratory to be used immediately for castings display and inspection may ultimately be used for installation of an induction melting unit, precision casting equipment, and a metal pattern shop.

Research projects to be undertaken by the research foundry will include:

Production of experimental castings for all company operating divisions.

Development of the simplest and most economical method of producing such castings.

Developing of gating, risering, pouring rate and time, core mixtures and sand mixtures for specific castings and types of castings.

Examination of such castings chemically, physically and metallurgically to insure sound castings which will meet all specification requirements.

Consultation with supervision of production foundries about to make particular castings to insure that the job is ready for production, that no further research is necessary, and that the men who are to produce the castings are in agreement.

Evaluation and trial of all new raw materials used in foundries including core sands, core binders, oils, core coatings, molding sands, bonding clays, seacoal and substitutes, ferroalloys, fuels, fluxes and others.

Research in new molding methods including blowing molds, vacuum casting and the test of new molding machine design.

Research in core making, baking and properties.

Research in all phases of metal melting. With a cupola and direct-arc electric furnace, either one or a cambination of both will be used in determining effects of melting media on properties of metal produced. Research in basic cupola operation is one example of this type of project.

Research in production of higher strength irons including nodular graphite irons.

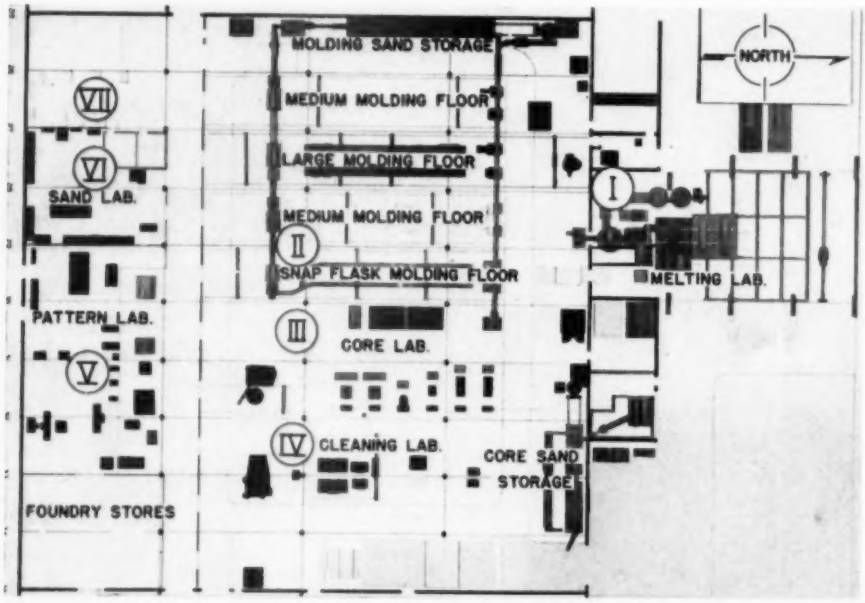
Research in various heat treatments of cast irons.

In co-operation with various engineering departments of the company's operating divisions, the determination of the best and most economical compositions of castings for use in particular applications such as diesel cylinder heads, exhaust manifolds, heat control valves, cast camshafts, and others.

Development of specifications for irons produced as well as for all raw materials used.

Continuing studies of performance of various production foundries of the company.

Assistance to company production foundries on operating problems and installation of equipment.



Departmental layout of the new research foundry

Book Review

Hot-Tinning **by W. E. Hoare, 112 pages, 6 x 9¾ in., published by Tin Research Institute, Fraser Road, Greenford, Middlesex, England, and available free of charge from Tin Research Institute Inc., 492 West Sixth Ave., Columbus 1, O.**

Providing complete working instructions for production of hot-tinned coatings on fabricated articles and components, this booklet is compiled to meet the needs of operative tinners, foremen and design engineers. Procedures for cleaning, pickling and fluxing ferrous and nonferrous metals, and the dip-tinning operations are described in detail. The book is divided into nine chapters and three appendixes. First chapter comprises the introduction and discusses choice of the tinning process and the theory.

Chapter 2 deals with operation and plant in general while chapter 3 describes in detail the tinning of steel, including quality of steel, degreasing, pickling, fluxes, and tinning. Chapter 4 pertains to tinning of cast iron, giving detailed information on obtaining good coatings of tin. Chapters 5 and 6 cover tinning of copper and other metals, while chapter 7 discusses tinning with lead-tin alloys. Chapter 8 is concerned with treatment of tinning shop residues and chapter 9 describes methods of determining thickness and continuity of tin coatings.

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Clearfield Mixers

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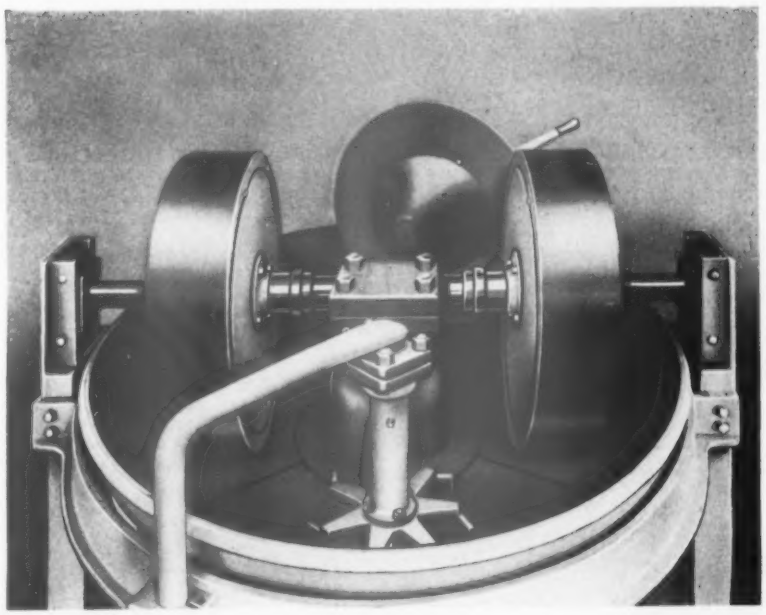

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EXPANDED LABORATORY FACILITIES

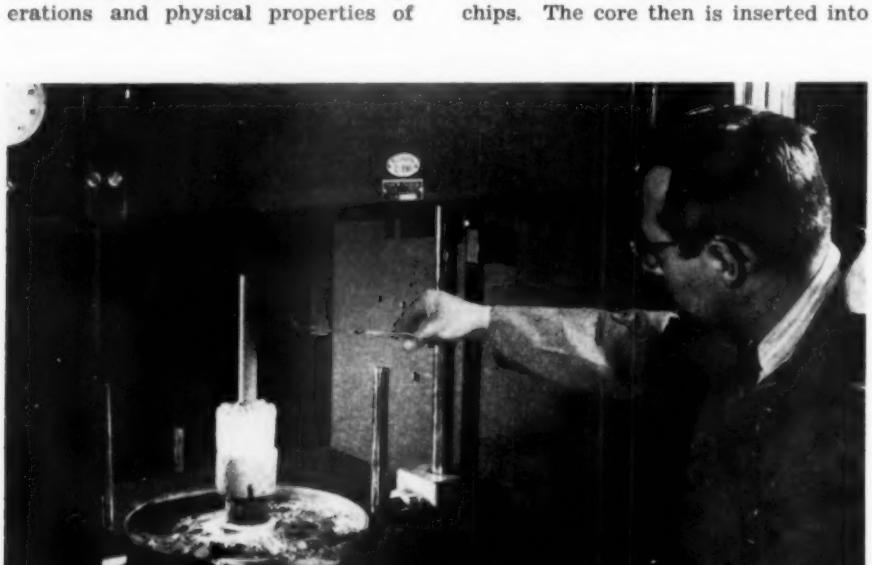
Provided for Core and Mold Wash Study

ONE important research and development activity in the new, recently expanded foundry products laboratory of United States Graphite Co., Saginaw, Mich., is directed at finding how castings are affected by core and mold washes applied on various sand mixtures used in foundries.

Careful control is maintained over all sand preparations and on all operations and physical properties of cores and molds under test. Foundry facings are applied to test cores and molds, and testing is done with a dilatometer which simulates conditions during casting. This instrument affords accurate control of such factors as temperature, atmosphere, and ferrostatic pressure.

A core made with a cavity that has been coated with core wash and dried then is charged with cast iron chips. The core then is inserted into the hot zone of the dilatometer where it can be subjected to temperatures as high as 3000° F. The chips melt and form a casting in the shape of a small pellet. After cooling, the core and casting are sectioned. The surface and structure of both are examined. Ease of removal, amount of coating remaining, degree of burn-in and other factors are noted and a coating evaluation is made.

A 4½-in. diam cupola is used to provide molten metal to confirm laboratory findings under actual foundry conditions. The effect of graphite additives to sand mixtures as well as facings is studied along with the effect of graphite additions to metal in ladles and cupola charges. Refractory mixtures containing graphite also can be tested.



Left: Testing a prepared core with the dilatometer

Below: Laboratory where foundry sands, core and mold washes, and other company products are tested under simulated foundry conditions

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(SHOT and GRIT)

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Pangborn Service Engineers are skilled specialists, backed by Pangborn's 46 years' experience with blast cleaning and as pioneers with metallic abrasives. These men can tell you which size Malleabrasive will save you the most money for your type of work. Ask for a free recommendation. In your letter just tell us what you clean and the type of equipment you use.

Company "C" (name on request) switched from ordinary abrasives to Malleabrasive and now saves *$3016 per machine per year!* Nothing was changed but the abrasive, yet savings are reflected all through the shop. For example, changing to Malleabrasive saves $43.80 out of every $100 formerly spent for replacement parts.

Malleabrasive has been saving money for users like this for more than 10 years. Accurate reports from these companies prove Malleabrasive saves up to $4000 per machine annually—a saving which can cut cleaning cost up to 50% and more just by changing to Malleabrasive.

TEST GUARANTEED MALLEABRASIVE IN YOUR PLANT! The Pangborn Corporation will provide all necessary charts, forms and details. Test it and see for yourself why Malleabrasive *can be guaranteed* to outperform conventional abrasives when these comparative tests are properly run. Write for your free TEST KIT today to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland.

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LAYING OUT ANGLES FROM ONE TO NINETY DEGREES USING CHORDS

Many cases will occur in constructing and laying-out patterns, where a square protractor or bevel cannot be used, and in such cases the accompanying tables will be of service. It will be observed that the 10-inch radius can be easily taken on a 12-inch scale, the 22-inch radius on a 24-inch scale, and the 48-inch radius by laying down two lengths of the 24-inch scale.

To lay out the required angle, scribe an arc, using one of the given radii, then set the trammels to the length of the chord given in the tables for the required angle, lay out on the circle and connect these points with the center.

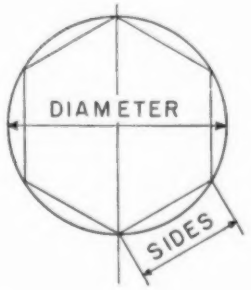
Angle in degrees	10-inch radius chord	22-inch radius chord	48-inch radius chord	Angle in degrees	10-inch radius chord	22-inch radius chord	48-inch radius chord
1	1/64	3/8	1/8	16	2 35/64	6 7/64	13 1/32
2	2/64	1/64	1 1/16	17	2 37/64	6 33/64	14 1/64
3	3/64	1 2/64	2 1/32	18	3 2/64	6 57/64	15 7/64
4	1/16	1 35/64	3 3/64	19	3 1/16	7 1/64	15 57/64
5	5/64	1 59/64	4 1/64	20	3 1/16	7 5/8	16 53/64
6	1 5/64	2 5/16	5 5/64	21	3 41/64	8 1/64	17 15/32
7	1 7/64	2 11/16	5 53/64	22	3 53/64	8 13/64	18 1/64
8	1 9/64	3 1/16	6 13/64	23	4	8 39/64	19 5/32
9	1 11/64	3 29/64	7 1/32	24	4 5/32	9 5/32	19 31/32
10	1 3/4	3 33/64	8 23/64	25	4 21/64	9 17/32	20 29/32
11	1 13/64	4 21/64	9 7/32	26	4 1/2	9 39/64	21 33/64
12	2 5/32	4 19/32	10 1/32	27	4 13/64	10 5/32	22 1/32
13	2 17/64	4 31/64	10 37/64	28	4 37/64	10 41/64	23 1/64
14	2 7/16	5 3/8	11 29/64	29	5 1/64	11 1/64	24 3/64
15	2 29/64	5 47/64	12 33/64	30	5 1/16	11 25/64	24 55/64

Angle in degrees	10-inch radius chord	22-inch radius chord	48-inch radius chord	Angle in degrees	10-inch radius chord	22-inch radius chord	48-inch radius chord
31	5 11/32	11 47/64	25 41/64	61	10 5/32	22 31/64	48 15/64
32	5 37/64	12 1/8	26 7/16	62	10 7/16	22 31/32	49 7/16
33	5 11/16	12 1/32	27 3/32	63	10 23/32	22 63/64	50 3/32
34	5 59/64	12 7/8	28 7/64	64	10 29/32	23 31/64	50 7/8
35	6 1/64	13 3/32	28 27/32	65	10 3/4	23 31/32	51 29/32
36	6 1/16	13 1/32	29 31/32	66	10 57/64	23 61/64	52 17/64
37	6 23/64	13 31/32	30 31/64	67	11 3/64	24 3/32	53
38	6 29/64	14 7/64	31 1/32	68	11 1/16	24 1/8	53 25/32
39	6 11/16	14 11/16	31 57/64	69	11 23/64	24 29/32	54 25/32
40	6 27/32	15 3/64	32 29/64	70	11 31/64	25 1/32	55 3/64
41	7	15 1/32	33 1/64	71	11 39/64	25 15/64	55 29/64
42	7 1/64	15 29/32	34 3/32	72	11 1/2	25 7/8	56 7/16
43	7 3/64	16 1/16	35 1/16	73	11 29/32	26 1/16	57 1/64
44	7 1/32	16 31/64	35 61/64	74	12 3/64	26 31/64	57 61/64
45	7 3/32	16 63/64	36 29/32	75	12 1/16	26 1/2	58 27/64
46	7 5/32	17 1/16	37 31/64	76	12 7/16	27 1/64	59 1/64
47	7 7/32	17 17/32	38 1/4	77	12 23/32	27 33/64	59 31/32
48	8 1/4	17 7/8	39 1/64	78	12 1/2	27 1/16	60 7/16
49	8 1/32	18 1/32	39 61/64	79	12 29/32	27 63/64	61 3/64
50	8 3/64	18 1/32	40 7/16	80	12 55/64	28 1/64	61 33/64
51	8 7/32	18 1/16	41 31/64	81	13	28 37/64	62 3/4
52	8 9/32	19 1/32	42 3/32	82	13 1/16	28 55/64	62 51/64
53	8 11/32	19 5/8	42 1/2	83	13 1/4	29 5/64	63 49/64
54	9 1/64	19 31/32	43 27/64	84	13 3/16	29 7/16	64 7/32
55	9 1/16	20 1/32	44 1/32	85	13 23/32	29 33/64	64 27/32
56	9 25/64	20 7/32	45 5/64	86	13 31/32	30	65 1/16
57	9 29/64	20 33/64	45 61/64	87	13 1/32	30 1/32	66 7/32
58	9 15/32	21 1/32	46 7/16	88	13 27/32	30 7/16	66 1/32
59	9 59/64	21 1/32	47 3/32	89	14 1/64	30 33/64	67 1/32
60	10	22	48	90	14 1/64	31 7/64	67 7/8

CHORDS OF ANGLES FROM ONE TO NINETY DEGREES

Angle in degrees	18-inch radius chord	36-inch radius chord	72-inch radius chord	Angle in degrees	18-inch radius chord	36-inch radius chord	72-inch radius chord
1	5/16	5/8	1 1/2	46	14 1/16	28 1/8	56 17/64
2	5/8	1 1/4	2 1/2	47	14 23/64	28 23/32	57 27/64
3	15/16	1 7/8	3 3/4	48	14 11/32	29 3/32	58 31/64
4	1 1/4	2 1/2	5	49	14 59/64	29 55/64	59 33/32
5	1 37/64	3 9/64	6 9/32	50	15 7/32	30 27/64	60 55/64
6	1 7/8	3 49/64	7 17/32	51	15 1/2	31	62
7	2 13/64	4 29/64	8 41/64	52	15 25/32	31 9/16	63 1/8
8	2 1/2	5 1/64	10 3/64	53	16 1/16	32 1/8	64 1/4
9	2 53/64	5 41/64	11 11/32	54	16 1/32	32 1/16	65 3/8
10	3 3/64	6 3/32	12 35/64	55	16 5/8	33 1/4	66 1/2
11	3 29/64	6 29/32	13 51/64	56	16 29/32	33 51/64	67 59/64
12	3 49/64	7 17/32	15 3/64	57	17 11/64	34 23/64	68 33/32
13	4 5/64	8 1/32	16 1/8	58	17 39/64	34 25/32	69 1/8
14	4 25/64	8 25/32	17 25/64	59	17 33/32	35 27/64	70 39/32
15	4 45/64	9 29/32	18 51/64	60	18	36	72
16	5	10 1/64	20 1/32	61	18 17/64	36 35/64	73 5/64
17	5 21/64	10 41/64	21 3/32	62	18 39/64	37 5/64	74 11/64
18	5 5/8	11 17/64	22 17/32	63	18 1/16	37 5/8	75 1/4
19	5 13/16	11 7/8	23 49/64	64	19 5/64	38 5/32	76 5/16
20	6 1/4	12 1/2	25	65	19 11/32	38 11/16	77 3/8
21	6 9/16	13 1/8	26 15/64	66	19 39/64	39 7/32	78 37/64
22	6 7/8	13 47/64	27 31/64	67	19 7/8	39 47/64	79 19/32
23	7 1/64	14 3/32	28 1/64	68	20 1/8	40 1/64	80 1/2
24	7 31/64	14 31/32	29 1/8	69	20 25/64	40 25/32	81 5/16
25	7 51/64	15 27/64	31 1/64	70	20 1/64	41 1/32	82 1/16
26	8 3/32	16 3/64	32 7/64	71	20 29/32	41 13/16	83 5/8
27	8 1/8	16 1/8	33 5/8	72	21 5/32	42 21/64	84 11/64
28	8 45/64	17 3/32	34 1/8	73	21 13/32	42 53/64	85 7/32
29	9 5/64	18 1/32	36 1/16	74	21 31/32	43 31/64	86 17/32
30	9 5/16	18 1/64	37 1/64	75	21 61/64	43 63/64	87 31/32
31	9 5/8	19 1/64	38 1/64	76	22 5/32	44 21/64	88 31/32
32	9 61/64	19 27/32	39 1/16	77	22 13/32	44 53/64	89 11/64
33	10 3/32	20 3/32	40 3/64	78	22 45/64	45 5/16	90 5/8
34	10 17/32	21 3/64	42 3/32	79	22 57/64	45 51/64	91 19/32
35	10 33/64	21 31/32	43 1/32	80	23 3/64	46 3/32	92 5/16
36	11 1/8	22 1/4	44 1/2	81	23 3/8	46 3/4	93 3/64
37	11 27/64	22 47/64	45 11/32	82	23 39/64	47 5/32	94 19/32
38	11 33/64	23 7/16	46 7/8	83	23 55/64	47 55/64	95 13/32
39	12 3/64	24 1/32	48 1/16	84	24 3/32	48 1/16	96 33/64
40	12 5/16	24 5/8	49 1/4	85	24 31/64	48 31/64	97 3/32
41	12 39/64	25 7/32	50 7/16	86	24 33/64	49 3/32	98 13/32
42	12 49/64	25 31/64	51 31/64	87	24 55/64	49 7/16	99 1/8
43	13 5/16	26 5/32	52 5/64	88	25	50 1/64	100 1/32
44	13 31/64	26 31/32	53 1/16	89	25 15/64	50 1/32	100 1/16
45	13 35/64	27 3/64	55 7/64	90	25 31/64	50 39/64	101 31/64

TABLE OF DIMENSIONS OF POLYGONS

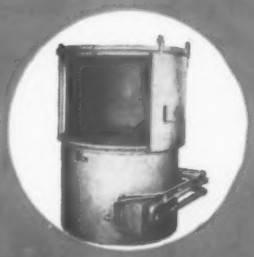


$$\text{Co-efficient} = \frac{\text{Diameter}}{\text{Side}} \qquad \text{Side} = \frac{\text{Diameter}}{\text{Co-efficient}}$$

$$\text{Diameter} = \text{Co-efficient} \times \text{Side}$$

No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.	No. of Sides	Coef.
3	1.16	28	8.93	53	16.88	78	24.83	103	32.79	128	40.75
4	1.41	29	9.25	54	17.20	79	25.15	104	33.11	129	41.07
5	1.70	30	9.57	55	17.52	80	25.47	105	33.43	130	41.38
6	2.00	31	9.88	56	17.83	81	25.79	106	33.74	131	41.70
7	2.31	32	10.20	57	18.15	82	26.11	107	34.06	132	42.02
8	2.61	33	10.52	58	18.47	83	26.43	108	34.38	133	42.34
9	2.93	34	10.84	59	18.79	84	26.74	109	34.70	134	42.66
10	3.24	35	11.16	60	19.11	85	27.06	110	35.02	135	42.98
11	3.55	36	11.47	61	19.42	86	27.38	111	35.34	136	43.29
12	3.86	37	11.79	62	19.74	87	27.70	112	35.65	137	43.61
13	4.18	38	12.11	63	20.06	88	28.02	113	35.97	138	43.93
14	4.49	39	12.43	64	20.38	89	28.33	114	36.29	139	44.25
15	4.81	40	12.74	65	20.70	90	28.65	115	36.61	140	44.57
16	5.12	41	13.06	66	21.02	91	28.97	116	36.93	141	44.88
17	5.44	42	13.38	67	21.33	92	29.29	117	37.25	142	45.20
18	5.76	43	13.70	68	21.65	93	29.61	118	37.56	143	45.52
19	6.07	44	14.02	69	21.97	94	29.93	119	37.88	144	45.84
20	6.39	45	14.33	70	22.29	95	30.24	120	38.20	145	46.16
21	6.71	46	14.65	71	22.61	96	30.56	121	38.52	146	46.48
22	7.03	47	14.97	72	22.92	97	30.88	122	38.84	147	46.79
23	7.34	48	15.29	73	23.24	98	31.20	123	39.16	148	47.11
24	7.66	49	15.61	74	23.56	99	31.52	124	39.47	149	47.43
25	7.98	50	15.93	75	23.88	100	31.84	125	39.79	150	47.75
26	8.30	51	16.24	76	24.20	101	32.15	126	40.11	151	48.07
27	8.61	52	16.56	77	24.52	102	32.47	127	40.43	152	48.39

MELTING AND HOLDING FURNACES



Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.

Bulletin 551 covers the complete melting line. Write for your copy today.

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BAROID'S bentonite deposits are so large that we never have to use any but top-grade raw material. This top-quality material is then very carefully graded and processed. Result: foundry bentonite that is consistently, uniformly, tops in quality.

These APPROVED DISTRIBUTORS will give you quick service

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Barada & Page, Inc.
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Wichita, Kans.
Dallas, Texas
Houston, Texas
New Orleans, La.

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Lloyd Canfield Foundry Supplies
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Seeks Fresh Ideas On Steel Castings

Steel Founders' Society of America has instituted a national awards program, with $1000 in cash prizes offered for technical papers dealing with new designs, redesigned steel castings, conversions and advanced uses for steel castings, including improved materials and methods applications to meet specific engineering problems. Basic aim of the program is to stimulate unbiased and original thinking and practical applications in regard to parts or products which can be made advantageously as steel castings.

First prize is $300. Two additional awards of $200 and $100 each, four others of $50 each, and eight $25 awards also will be made. The program is open to all persons except employees of the society and its member companies. Entry papers must be mailed by Dec. 1. Additional information may be obtained from F. Kermit Donaldson, executive vice president, Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15.

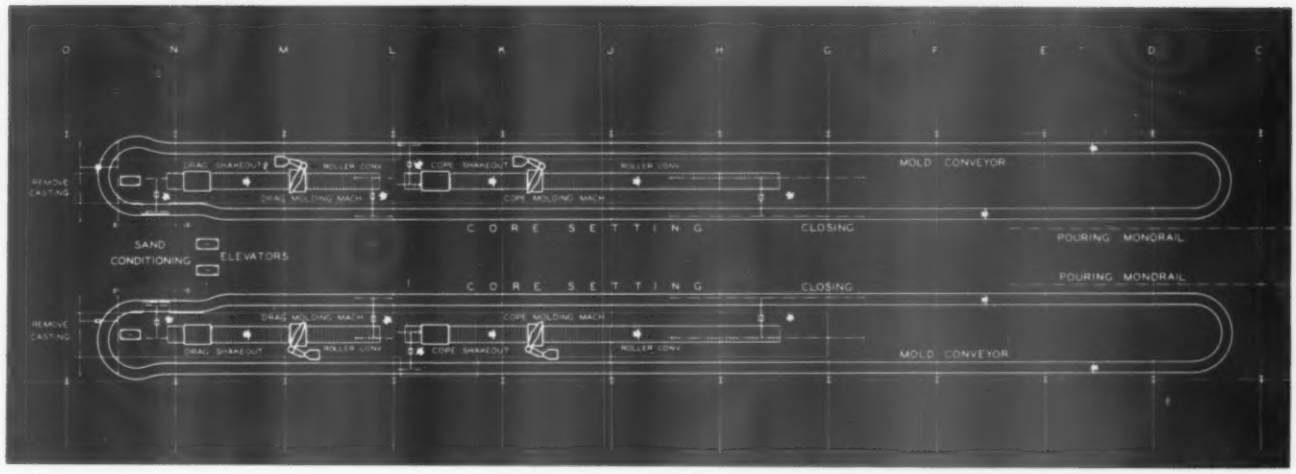
Book Review

AFS Apprentice Training Standards for the Foundry Industry; 24 pages, 6 x 9 in., published by the American Foundrymen's Society, 616 South Michigan Ave., Chicago.

At the meeting of the AFS Educational Division in Chicago, Oct. 18, 1946, the Apprentice Training Committee was instructed to revise the Foundry Apprentice Training Standards in use since 1926, and to revise the Patternmaking Apprentice Training Standards in use since 1939. The latest revision does not suggest new philosophies, but it does attempt to clarify and standardize existing successful practice.

The subject in detail is covered under these heads: Need for apprentice training; AFS apprentice training standards; training units molding; training units coremaking; training units wood patternmaking; training units metal patternmaking; related instruction; wage rates; administration of program; registration of agreement; certificate of completion; tools for all groups; books for apprentice training; films for apprentice training; AFS apprentice contest; sample contracts.

Chase Foundry & Mfg. Co., 2300 Parsons Ave., Columbus, O., suffered fire damage Aug. 14 estimated at $50,000.



CAMPBELL, WYANT & CANNON FOUNDRY COMPANY, MUSKEGON, MICHIGAN

Improved quality and increased production were the objectives in the engineering and construction of these new cylinder block molding systems.

The many features contributing to high quality production on these molding units were accomplished through the combined efforts of the Owner's production engineers and the foundry engineers of Giffels & Vallet, Inc.

Foundry improvements should be engineered to accomplish desired results and planned for a minimum of interference to existing production in the foundry.

GIFFELS & VALLET, INC.
INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING, DETROIT

Electro's NEW
GRINDING WHEELS
for IRON

Here is a new series of resin bonded, abrasive-combination wheels especially for iron work. They are so much longer-lived, they save from 30% to 50% on actual abrasive costs at vitrified speed (6500 sfpm) as well as at resin speed (9500 sfpm). More than that, they often save on labor costs, and they always equal labor cost of compositions replaced. For any nominal grit sizing they produce a finer finish. They assure an abrasive cost saving and may give you a labor cost saving in addition. Let us demonstrate. Send for details. Also, get free, our 64-page GRINDING WHEEL MANUAL illustrated in full color. ELECTRO REFRACTORIES & ALLOYS CORPORATION, 344 Delaware Avenue, Buffalo 2, New York.

Electro HIGH-SPEED GRINDING WHEELS

Management Group Issues Booklets

American Management Association, 330 West 42nd St., New York 18, has published a group of new pamphlets on management problems. In the general management series are: "Improving Management Communication," 75 cents; "Management Action to Reduce the Cost of Selling," 50 cents, and "Changing Concepts and Trends in Pension Planning," 50 cents.

In the production series are: "Gearing Foremen and Workers to Production Efficiency," 50 cents; "Practical Uses of Break-Even and Budget Controls," 75 cents; "Wages, Employment and Personnel Problems in a Changing Economy," $1.25; "Incentive Plans for Direct and Indirect Workers," 50 cents; "The Union's Role in Production Management," 75 cents; "Improving the Efficiency of Plant Management," 75 cents; "The Production Department's Responsibility for Profits," 75 cents, and "Management's Stake in the Welfare Issue," 50 cents.

The Personnel series includes: "Aptitude Testing, Training, and Employee Development," 50 cents; "Practical Operating Problems in Personnel Administration," 75 cents; "Industrial Applications of Medicine and Psychiatry," 75 cents, and "Pensions and Fact-Finding in Labor Relations," 50 cents.

Book Review

Manual on Fatigue Testing, 82 pages, 6 x 9 in., published by the American Society for Testing Materials, Philadelphia 3. Price $2.50.

This new manual on fatigue testing, prepared by the society's Committee E-9 on Fatigue, is to supply information to those setting up new laboratory facilities, to aid in operating the equipment properly, and to offer advice on presentation and interpretation of data. It is divided into eight sections dealing with symbols and nomenclature, fatigue testing machines, specimens and their preparation, test procedure and technique, presentation of data, and interpretation of data. The book also contains an extensive bibliography.

Meehanite Meeting

Manufacturers of Meehanite castings will hold their annual convention in Chicago, Nov. 8-11, under the auspices of Meehanite Metal Corp., New Rochelle, N. Y. Headquarters will be at Hotel Knickerbocker.

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90 Standard Types
1400 Different Sizes

Many Special Designs
to meet
Special Requirements

Foundries in which
MAXIMUM PRODUCTIONS
are maintained are equipped
with

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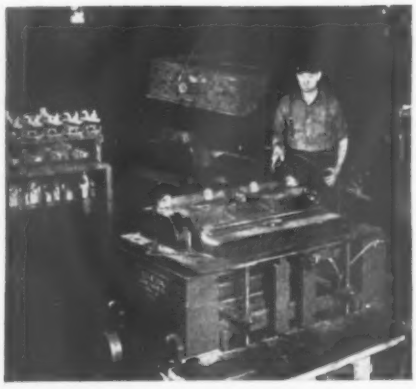
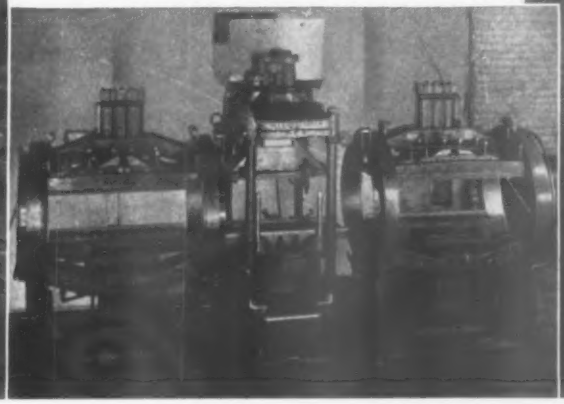
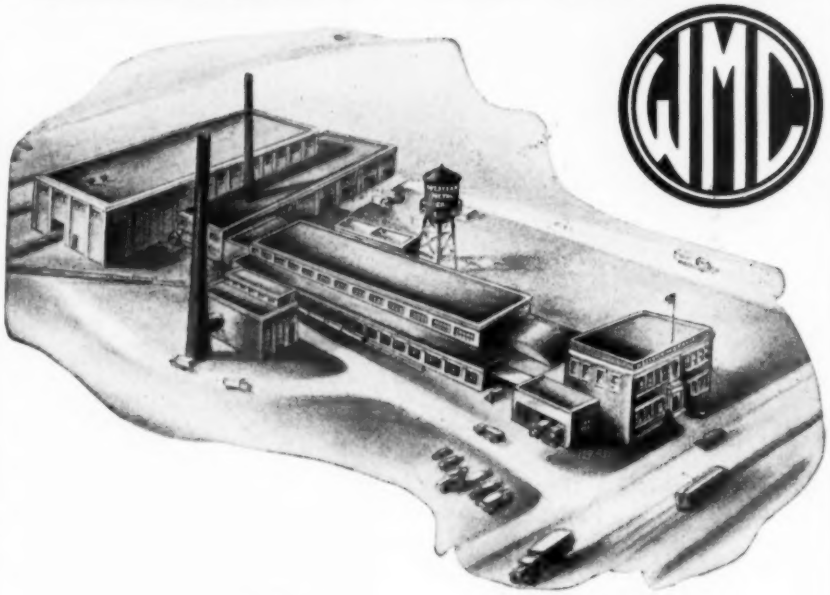
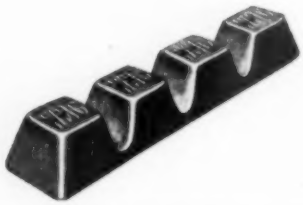


INTERNATIONAL
MOLDING MACHINE CO.
La Grange Park, Illinois



CAPACITY TO SERVE!





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OBITUARY

WILLIAM H. SHILLING, 66, for many years superintendent of the Atlas Foundry Co., Cleveland, died in that city Sept. 3. Mr. Shilling entered the foundry industry as a boy in 1897 and for a time was with the former Allyne Brass Foundry Co. and the Winton Engine Co., Cleveland. He joined the Atlas Foundry Co. in 1915 as superintendent shortly after its incorporation, retaining this position until 1948, when ill health forced him to transfer from active duty to an advisory capacity. Mr. Shilling was interested in foundry training work and was instrumental in establishing the foundry department of Cleveland Trade School.

* * *

Robert B. Fischer, 61, president and general manager, Quincy Stove Mfg. Co., Quincy, Ill., died at his home there Aug. 29. Mr. Fischer became associated with the company in 1926, served in the sales department, and was named secretary-general manager in 1946, prior to becoming president.

* * *

James F. Crevie, 69, retired foundryman, died Aug. 10 in Chicago. Mr. Crevie was associated with Ferguson & Lange Foundries Inc., Chicago, until 1943, as foundry superintendent. He served in a similar capacity with the former Koepke Foundry Co. there, until his retirement.

* * *

Henry A. Curtis, for the last 13 years metallurgist, Rock Island Arsenal, Rock Island, Ill., died July 22. During the war Mr. Curtis took an active part in armor plate development and was responsible for many improvements in aluminum castings for ordnance applications.

* * *

Frank W. Brant, 60, president, Stamford Foundry Co., Stamford, Conn., died at his home there Aug. 22, following a brief illness. Mr. Brant, who was born in New Canaan, Conn., had been associated with the foundry company for 44 years.

* * *

Joseph Kornicke Sr., 75, who until his retirement 18 months ago had been a foundry foreman for 50 years at the Moore Bros. Co., Elizabeth, N. J., died there Aug. 13. Mr. Kornicke was born in Poland and had resided in Elizabeth for 65 years.

* * *

Peter Stefan, veteran service engineer, Beardsley & Piper, Division of Pettibone Mulliken Corp., Chicago, died Aug. 16, in Cleveland, following a long illness. Mr. Stefan joined the

company in 1922 after working in the molding departments of various foundries.

* * *

Richardson O. Collins, 69, president, R. O. Collins Iron Works, Tallahassee, Fla., died there Aug. 18, following a brief illness. Mr. Collins, a native of Twiggs County, Ga., had been in the iron foundry business for 54 years.

* * *

William H. McDowell, consulting engineer at the Electro Metallurgical Division, Union Carbide & Carbon Corp., Niagara Falls, N. Y., died Aug. 3.

* * *

Harold S. Arnold, technical assistant to the president, International Nickel Co. Inc., New York, died Aug. 7.

* * *

Alfred J. Miller, 76, president, Ramapo Foundry & Wheel Works, Ramapo, N. Y., died Aug. 12.

Book Review

Technique of Industrial Patternmaking (Technique du Modelage Industriel), by O. Querut, paper, 73 pages, 6¼ x 9½-in., published in French by Librairie Polytechnique Ch. Beranger, Paris and Liege. Price 108 Belgian francs or 600 French francs.

Dealing with wooden patterns, the book is intended primarily as a textbook for use in technical schools. Text is confined to less than 25 pages; 52 pages of illustrations show methods of designing and making patterns

General principles, covering planning and organization of a pattern shop, are given. Main body of the text analyzes steps in making a pattern. Four sections cover the work: 1. Method of work as governed by the nature or design of the casting. 2. Conditions to be fulfilled in meeting requirements of molding method, with special reference to contraction and draft, and to coreprints. 3. General methods of making, assembling, and finishing patterns and coreboxes. 4. Special cases including loam molding, special patterns for gears and helicoidal bodies.

Wins Award

Mid-West Abrasive Co., Owosso, Mich., received honorable mention for its 1949 annual report in the tenth annual survey conducted by the magazine, *Financial World*. The survey covered approximately 2500 annual reports issued by companies throughout the United States. Awards are made on the basis of content, format, and typography.

I know—
"CERTIFIED"
is the best abrasive
As Purchasing Agent I have to see that the abrasive we use is the most economical. This means a hard, slow wearing abrasive like "Certified" . . . one that can be used over and over. An abrasive that does a good job in the cleaning room . . . one that gets castings really clean in a hurry.
"CERTIFIED" IS TOPS! Each grain of Samson Shot and Angular Grit is a solid homogenous mass that wears slowly, lasts longer for top-efficiency blast cleaning at lowest cost. "Certified's" special automatically controlled hardening process gives 'em plenty of extra hardness for cleaner castings. Order "Certified" today for faster, better, cheaper blast cleaning.
100 LBS.
ANGULAR
GRIT
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MEMBER FEMA
Always specify "Certified"
PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

Industry BRIEFS

VULCAN Mold & Iron Co., Latrobe, Pa., plans construction of a $1-million plant at Lansing, Ill., in the Chicago district, for manufacture of ingot molds and accessories. Plant will consist of two buildings housing the foundry, pattern shop and a chemical and metallurgical laboratory. Capacity will be about 50,000 tons a year; ingot molds to be produced will weigh 250 to 60,000 lb each. Construction is scheduled for completion Apr. 1.

* * *

National Battery Co., First National Bank Bldg., St. Paul, has changed its name to Gould-National Batteries Inc. Gould Storage Battery Corp., National subsidiary, also will operate under the new name although its sales and field engineering headquarters will continue at Trenton, N. J. Policies, management and operation of each company will be unchanged.

* * *

Goss Printing Press Co., Chicago, has started construction of the first unit of a new $4 million plant in Cicero, Ill., replacing old buildings. Operation of company's brass and aluminum foundry will continue unaffected at its present location until additional construction is undertaken. The company closed its foundry in Battle Creek, Mich., about six months ago. Although idle, the shop is intact. Goss acquired the foundry three years ago through purchase of the Duplex Printing Press Co., which it now operates as its Duplex Division.

* * *

Lima-Hamilton Corp., an organization formed by the merger of General Machinery Corp., Hamilton, O., and Lima Locomotive Works Inc., Lima, O., will merge with Baldwin Locomotive Works Inc., Philadelphia 42. New company will be known as Baldwin-Lima-Hamilton Corp. George A. Rentschler, executive committee chairman of Lima-Hamilton, will become board chairman of the new corporation.

* * *

W. G. Reichert Engineering Co., 1060 Broad St., Newark 2, N. J., has formed a new division known as the Push-Button Foundry Equipment Division. It provides for the manufacture and installation of automatic molding, shakeout, and pouring machines and equipment.

* * *

Taylor & Fenn Co., 54 Arch St., Hartford, Conn., has started construction of a new foundry in Windsor, a suburb. Construction is scheduled for completion Apr. 1. New plant will serve as a jobbing specialty shop, producing alloy gray iron castings up to 5 tons. Production will include ductile iron and Ni-Resist nickel grades. Meanwhile, the company is liquidating its machine tool division to concentrate future activity on foundry work.

* * *

Ajax Flexible Coupling Co., Westfield, N. Y., has appointed as representatives Samson Sales Co., 420 Market St., San Francisco; Thurlow Equipment Division, G. Donald Bradley Co., 4402 White Bldg., Seattle, and Boyd Goodhart, 1425 Troost Ave., Kansas City, Mo.

* * *

National output of molding sand for 1949 was 6,113,520 short tons compared with 8,265,451 short tons in 1948—a decline of 26 per cent. Average value per ton was $1.66—up 10 cents from 1948, according to the United States Department of the Interior, Bureau of Mines.

* * *

Allison-Bedford Foundry, Bedford, Ind., formerly operated by the Allison Division of General Motors Corp., has been made a separate division of the corporation and is now known as the Bedford Foundry Division. C. M. Jessup is general manager.

* * *

J. L. Johnson & Sons Inc., 1700 North Calhoun St., Decatur, Ill., have purchased Decatur Foundry Inc., 1040 East Pearl St. Consolidation of operations is contemplated in the recently erected new Johnson foundry building.

* * *

Harbison-Walker Refractories Co., Pittsburgh, has acquired approximately 45 acres of land located at Windham, Portage County, O., for erection of a plant to produce silica refractories. Operation of the first unit is contemplated within a year.

* * *

Electric Steel Foundry Co., 2141 NW. 25th Ave., Portland, Oreg., has moved its Spokane branch from So. 121 Monroe St. to No. 1327 Washington St. N. J. Vanelli is manager.

* * *

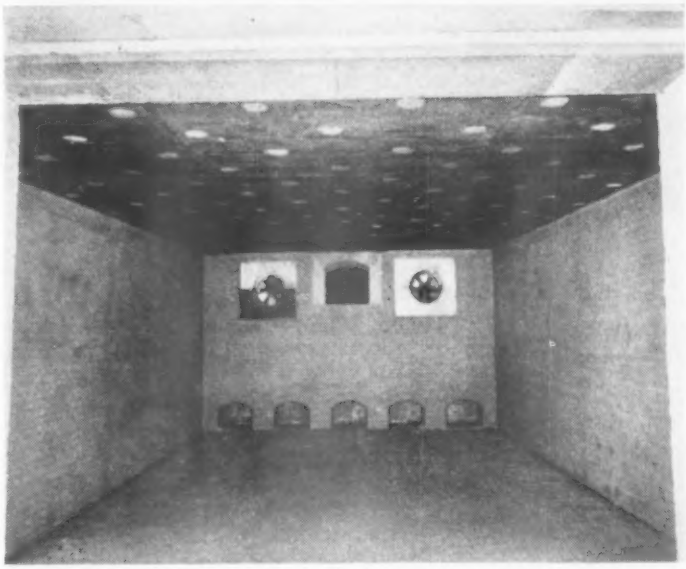
Valley Foundry & Machine Works Inc., 2718 East Ave., Fresno, Calif., expects to complete by the end of this year a $250,000 expansion proj-

(*Concluded on page* 188)

NEW LABORATORY: Massachusetts Institute of Technology has begun construction on the Sloan Metal Processing Laboratory which is designed to house a pioneering program of education and research in metallurgical science as applied to basic manufacturing processes. Made possible by a $1 million gift from Alfred P. Sloan Jr., chairman of the board, General Motors Corp., the laboratory is scheduled for completion late in 1951. Among its facilities will be a well-equipped foundry and powder metallurgy equipment

Improved Annealing Cycles

Through A. P. GREEN *Engineered* REFRACTORY LININGS



Oil-fired annealing oven for malleable castings. The flat suspended arch is KAST-O-LITE and the sidewalls are G-23 Insulating Firebrick.

A. P. Green KAST-O-LITE insulating refractory castable was used throughout sidewalls and arch for this pulverized coal-fired oven.

Malleable operators report easier controlled annealing cycles through the use of the proper combination of A. P. Green refractories. Efficient furnace operation means lower production costs and better control of the physical properties of the castings. It can only be achieved by a refractory enclosure which contributes to the desired annealing cycle.

The two ovens illustrated are typical examples of A. P. Green engineered refractory linings. One is a complete monolithic lining of A. P. Green KAST-O-LITE, a light weight castable refractory. The other is a combination lining — KAST-O-LITE arch and G-23 Insulating Firebrick sidewalls. Both have excellent performance records effecting improved product quality at reduced fuel costs.

The A. P. Green Fire Brick Company Engineering Department will assist you with further information on the application of these materials to new units or the conversion of existing furnaces. Call your local A. P. Green distributor . . . he's listed in the yellow pages of your telephone directory . . . or write . . .

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A. P. GREEN REFRACTORY PRODUCTS

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HAUSFELD FURNACES

FOR GAS OR FUEL OIL

ARE MEETING EVERY EXACTING REQUIREMENT

FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

HAVE YOU INVESTIGATED THEM FOR YOUR MELTING PROBLEMS?

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Concluded from page* 186)

ect begun four years ago. All operations are being transferred to the new plant from the old location at 710 H St.

* * *

Mechanical Foundries Division, Food Machinery & Chemical Corp., Vernon, Calif., which has occupied part of the building formerly used by Peerless Pump Division of the corporation at Quincy, Ill., is being moved to Indianapolis.

* * *

Guild Steel Products Corp. has been incorporated in New York as a foundry and machine shop. Directors are Jacob S. Lampert, Ruth Sender, and Lester G. Grey, 200 West 57th St., New York.

* * *

Precision Metalsmiths Inc., 6511 Cedar Ave., Cleveland, has added 11 new casting alloys with specialized properties for production of small or intricate parts. Company now has 91 special purpose alloys.

* * *

The Trabon Co., 122 S. Michigan Ave., Chicago 3, established in 1947 as a manufacturer of core oils and chemicals and manufacturers' agent for foundry supplies, has changed its name to Kordell Industries Inc.

* * *

Columbia Steel Co. of Los Angeles and San Francisco has leased the steelmaking facilities of a wartime steel foundry at Pittsburg, Calif. Capacity of the plant is about 60,000 tons of ingots yearly.

* * *

Central Foundry Division, General Motors Corp., Danville, Ill., plans expansion of its malleable foundry section and facilities. Completion of the program is scheduled for late 1950.

* * *

Hill & Griffith Co., manufacturer of foundry facings and supplies, suffered fire loss estimated at $10,000 Aug. 15 in its mill building at 1262 State Ave., Cincinnati.

* * *

Berea Foundry Inc., 11201 Berea Rd., Cleveland, early in August was damaged by fire to the extent of $10,000, including both contents and the plant structure.

* * *

Nook & O'Neill Inc., Cleveland, representatives for Automatic Transportation Co., Chicago, has moved into a new building at 2515 Payne Ave.

* * *

Root Mfg. Co., Baxter Springs, Kans., is building a new 50 x 150-ft foundry building.

How To Sell to The Government

Trilane Associates Inc., One Hudson St., New York 13, has published a new United States Government procurement brochure containing information designed to aid manufacturers in selling their products and services to the government. Free copies are available.

Trilane also publishes the "Government Procurement Daily Bulletin," which lists all invitations to bid issued each day by the government's 2500 procurement agencies through the country; the "Daily Construction Bulletin," which lists all construction invitations issued by the various branches of the Armed Forces; and the "Weekly Review of Government Procurement," which lists all major awards made by the Armed Forces during the week and includes a number of editorial features dealing with procurement news.

Film Describes Acetylene Uses

"The Oxy-Acetylene Flame—Master of Metals," a 20-minute, sound-color motion picture on oxy-acetylene welding and cutting, has been produced co-operatively by International Acetylene Association and United States Bureau of Mines. Film sequences describe how calcium carbide and acetylene are produced and show workings of welding and cutting torches, and oxygen and acetylene regulators. Foundry and fabrication plant applications also are illustrated.

Film copies may be borrowed from Supervising Engineer, Graphic Services Section, Bureau of Mines Experiment Station, 4800 Forbes St., Pittsburgh 13, or purchased from the secretary, International Acetylene Association, 30 East 42nd St., New York 17.

Book Review

Conference on Foundry Steel Melting, paper, 73 pages, 8½ x 11 in., published by the British Iron & Steel Research Association, 11 Park Lane, London W. 1, England. Price 10s.

Contains 15 papers and discussion presented at the fourth conference of the British Iron & Steel Research Association held the fall of 1949. Papers are divided into groups and pertain to the cupola-converter process, electric arc process, other melting processes such as open-hearth and high-frequency induction, and general phases including productivity, fluidity and cost of melting.

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How you can cut costs • speed operations • gain:

- ✓ REDUCED HANDLING TIME
- ✓ UNINTERRUPTED SMOOTH FLOW IN PRODUCTION
- ✓ CAREFUL, SAFE HANDLING OF LIGHT OR HEAVY MOLDS—
- ✓ BETTER STORAGE FACILITIES
- ✓ CONSERVE AND UTILIZE EXISTING FOUNDRY SPACE

Conveyors are unequalled in low first cost, flexibility of application for a variety of foundry handling needs, minimum operating or maintenance expense.

Foundry conveyors are designed and built in their entirety by Standard including the vital bearings, sealed and shielded—expressly designed for severe foundry service.

Available in a wide range of sizes, weights and types — as complete systems—or individual portable sections. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

Send for Standard's special catalog "Conveyors for Foundries" — a valuable reference book illustrating and describing conveyor installations in leading foundries.

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Adventures of BILL

By PAT DWYER
Drawings by RICHEY

ONE night recently while leafing idly through an old scrapbook, I came across a newspaper clipping that sent my mind racing back through time and space—nearly forty years of the first and nearly two thousand miles of the second. The clipping was from a local paper long since out of existence—a common fate of newspapers. The item was a reproduction of the famous cartoon by the late John T. McCutcheon and appeared originally in the *Chicago Tribune*. The cartoon appeared under the arresting and significant title "The Colors." Unanimous opinion at the time indicated that it was McCutcheon's masterpiece, the brightest jewel in a long and remarkable list of achievements. Universal appeal was indicated by its adoption and reproduction in most of the country's newspapers.

The cartoon appeared first on Aug. 7, 1914, a week after the outbreak of war in Europe. It reflected the attitude of the cartoonist and the attitude of all sensible people on the subject of war. It also showed a prophetic peep into the future. The cartoon was presented in four divisions: A field of corn and green trees; a field of battle under a smoky and crimson sky and the ground covered with sprawled human bodies; a field of mourners; and a vast field of tombstones. A brief verse accompanied the cartoon:

Cold and green are the fields in peace;
Red are the fields in war.
Black are the fields when the cannons cease
And white for ever more.

Bill recognized the clipping when I showed it to him.

"I remember," he said, "the interest it created. Many people were quite confident it would keep the country out of the war. Well, it didn't. People talked a lot but did nothing. 'Tis a common human failing. People in the mass gripe and grumble over certain real or fancied grievances, but when they have the opportunity to register their grievances at election time, they stay home or continue their usual program of work or play. I have heard individuals boiling over a minor item to a greater extent than a whole community boiling over a serious major issue. Did I ever tell you about the way big Mike Shannon blew up one night over a random remark made by a visiting lecturer?"

"No," I said, "but if the lecturer was no better than some I have heard, you definitely can count me among the supporters in Mike's corner."

"After serving three consecutive seven-year periods in the British army, brave Michael was discharged and pensioned as a sergeant major. Still in the pink of physical condition, as hard and tough as the Rock of Cashel, Mike got a job as general labor foreman in the blast furnace department of the steel plant where, at the time, I was toiling more or less diligently in the foundry. He was the ideal man for the job. He had a place for everything and everything in its place by a gang as neat and smart and efficient as any of the barrack groups he had drilled in the days when he represented the high justice, the middle and the low.

"Mike and Dinny Mulholland and I left the local theater one night after listening to an Irish lecture by—I think, but I am not sure—Seumas Macmanus. Dinny and I enjoyed the lecture, but Mike was fit to be tied. He stopped in the middle of the sidewalk and declared that if he had his way he would be delighted to serve on a committee that would take Shamus out to the middle of the harbor and then carefully throw him overboard with a king-size grindstone dangling from his neck.

"The lecture was based on material from several books written by the speaker on the folk lore of Ireland with particular and intimate reference to giants, ghosts, fairies and leprechauns. The lecturer explained carefully that people in modern Ireland smile tolerantly over any reference to the part played by these characters in the good owld days.

"However, he admitted that in some of the wilder parts of the coun-

(*Continued on page* 192)

The well known bug in a rug has nothing on the boys in red flannel petticoats

We boost our oven capacity with MONSANTO RESINOX core bonding resins

says

Arthur Vandenburg

Foundry Supt., Allied Steel Castings Co., Harvey, Ill.

Baking cycles of Resinox-bonded cores are extremely rapid—often up to *twice as fast* as the baking cycles of non-resin bonded cores. This means you can double the output of your core baking ovens . . . with no extra equipment. You can eliminate production bottlenecks at the baking ovens, and step-up efficiency to meet current demands for more metal castings. At the same time, you can produce better castings, at lower cost, with the many extra advantages of Resinox:

Less Core Breakage . . . Finer Finish

Resinox bonded cores have higher baked tensile strength and hardness . . . thus reduce core breakage. They have a finer surface finish, so that castings are smoother, have more accurate detail.

Longer Storage . . . Less Scrap Loss

Cores with Resinox can be stored for indefinite periods with a minimum of deterioration. They have adequate hot strength—yet collapse readily and completely, assisting shake-out and reducing scrap from hot tears.

Speeds Production . . . Increases Efficiency

Resinox greatly reduces the smoke nuisance in your plant; improves working conditions, increases worker efficiency.

→ Resinox finds new use in "C" Process

In the "C" Process, Monsanto's Resinox dry resin compounds are used to bond sand to produce thin, extremely lightweight foundry molds. This new technique promises to revolutionize the foundry industry. Its advantages include: exceptional dimensional accuracy, extremely fine surface finish, greater rate of production, better metal yields.

Resinox: Reg. U. S. Pat. Off.

Write today for production information about the use of Resinox resins for core bonding and for the "C" Process.

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SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division
Dept. FP 2, Springfield 2, Mass.

Please send me information on:

- ☐ Resinox phenolic resins for core bonding
- ☐ Resinox Production Information Bulletin No. 61 on the "C" Process

Name & Title _____

Company _____

Address _____

City, Zone, State _____

SPEED UP
CLEANING of LARGE CASTINGS

If cleaning large castings is a *s-l-o-w* process in your plant—*speed up* your cleaning operation with a Pangborn Air Blast Cleaning Room!

Work can be loaded or unloaded from *both* ends and heavy, cumbersome castings are quickly and easily handled with either a car or overhead conveyor. Large castings are cleaned in a jiffy, assuring you a *smooth flow of work* from shakeout, through cleaning and on to grinding and inspection.

Pangborn has *job-proven* Air Blast Room designs to meet all cleaning requirements. Features include plenty of illumination on the work, automatic abrasive recovery which removes sand, refuse and dust *before* returning abrasive for re-use.

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Look to Pangborn for the Latest Developments in Blast Cleaning and Dust Control Equipment

More than 25,000 Pangborn Machines Serving Industry

Pangborn

BLAST CLEANS CHEAPER with the right equipment for every job

(*Continued from page* 190)

try, Donegal, Galway and Connemara, say 40 miles from a railroad where the people speak Gaelic and burn turf, the belief in the supernatural is still common. Since it is well known that the Little People never try to carry little girls into their underground chambers, the parents dress their little boys, up to the age of nine, in red flannel petticoats. Presumably they figure that if a hardy little gossoon of nine can't defend himself, the fairies might as well have him.

"On one occasion a scoffing American heretic had doubted the efficacy of the red petticoat. He had grown up in the belief, inculcated by his parents, that the fairies were exceptionally smart and clever little fellas.

Some day he will be sorry

He claimed that a red petticoat would not fool him. Certainly it would not deceive these here now super-duper little sharpies. He was told coldly, firmly and triumphantly that in the long history of the Clan, away back beyant the days of Brian Boru, there was not one single, solitary instance to show the fairies had abducted a little boy concealed in the folds of a red flannel petticoat. "And what," the local chief inquired courteously, "do you know about that?"

"Did you hear the omadhaun," says Mike. " 'The wilder parts of the country 40 miles from a railroad!' He seemed to think that unless a man heard a locomotive whistle now and again he was practically a total loss. Millions of people in all parts of the world never heard a locomotive whistle, but that did not prevent them from mental and physical development. However, his slur falls flat, because as a plain matter of fact well known to one and all with the excep-

(*Continued on page* 194)

There is a foundryman in town,
Resourceful, keen and wise.
He's hit by heavy shortages,
Aye, right between the eyes!
But does he quit? Emergency?
He wins! and alway will.
Combining bonding clays just right,
He makes good castings still.

—Apologies to Everybody

This column was never very funny, so we won't make it very sad. However, I would like to get reasonably serious (don't be afraid—I'm not selling war bonds). Maybe I only feel serious because I wasted most of last night fishing instead of sleeping (or is the fishing season over?) Anyway, I wonder how many foundrymen are ready for a long siege of shortages; whereupon I get sad. Fetch out the beer, son, I'm going to cry.

There is no shortage of Black Hills Bentonite, Dixie Bond, Revivo, and the rest, but doggone it, every day there is something! One day there is a car shortage; the next day there is a strike somewhere, (and still a car shortage). The next day there is an emergency shipment (still a car shortage). The next day we lose 12 hours on a break-down—and so it goes, day in and day out.

Yes, I know that since 1940 foundrymen have learned to do the impossible when confronted with shortages. They have learned how to make good castings without charcoal pig, or all-steel rail, or 60% pig iron charges. They learned how to use low-carbon coke, 24-hour coke, and off-grade raw materials of many types. But in every case the going was tough. Necessity was the mother of invention—but the father was a headache.

Since World War No. II we have done a lot of work to develop maximum versatility in synthetic sands, aiming to avoid headaches should emergencies come knocking again. Westonite was one answer, but it was not universal because of high cost in operations with extensive core sand dilution. Also, Westonite is versatile from the standpoint of the size and variety of casting made, but it certainly is not the answer to a car shortage or general emergency. Therefore we have worked carefully on clay combinations which may be expected to solve the problem. This work has not been all experimental; rather, most of it has taken place right in the foundry.

Combining clays is not a new trend, but their wide use is relatively new. Many foundrymen used to prefer the "simple" system of one clay. However, in most applications this one-clay system was not really simple, because it required special additions, anti-bonds, "cushions", etc. Hence, the argument against confusing the muller man with more than one addition didn't hold water. Furthermore, it has been demonstrated that in many applications clay combinations are cheaper because they reduce scrap. Besides, they are cheaper because they employ each clay to maximum advantage, a very desirable objective.

The most versatile sand system in gray iron today is very popular in the automotive field. Three basic clays are combined to suit the job. A typical and excellent combination consists of 50% Revivo Bond, 25% Dixie Bond and 25% Black Hills Bentonite. In this case each clay is playing its own part to maximum advantage . . . Revivo is the "foundation". It provides clay bulk, expansion control, durability or long life, uniform strength with fluctuating water and clay additions and low cost . . . Dixie contributes green strength, easy shake-out, flowability, permeability, and good finish . . . Black Hills Bentonite controls the hot strength, besides resisting cuts and washes . . . Working as a team, they make synthetic sand practice versatile and as trouble-free as sand control can get.

This combination is also your best answer to quick changes or stoppages. Suppose you suddenly have to switch from water-pump bodies to machine tools—or vice versa—(and what could be versa?) You can maintain the same "foundation" of Revivo and merely switch the balance between Dixie and Black Hills with a minimum of loss or effort. Or suppose that car of bentonite falls off the track somewhere? You can then raise the Revivo, reduce the Dixie and get along for a few days. Sure, you will lose a little flowability when you drop down on Dixie, and you'll still make good castings. What would you do if you used only bentonite or even Black Hills Bentonite and Dixie, and one of them was cut off for a while?

That's right, son, you'd be in a mess. With three clays you have a chance. More important, such a combination may easily turn out to be the very best sand practice for you—with or without an emergency. What more could you ask—heh?

★ ★ ★

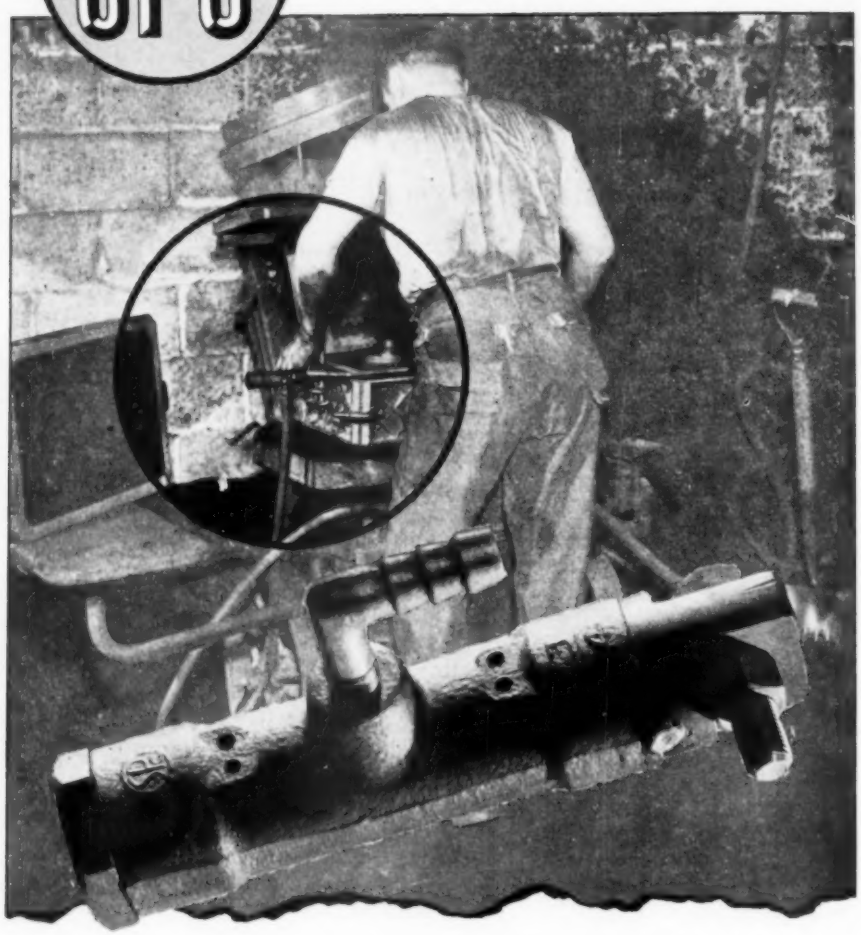
EASTERN CLAY PRODUCTS, INC.

"Bonding Clays Sold With Service"

JACKSON, OHIO

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

SPO AIR VIBRATORS



FOR LOW-COST EFFICIENCY AND LONG SERVICE LIFE

Powerful Series 76 **SPO** air-vibrators are foundry-engineered for maximum efficiency and low-cost operation. These durable impact-vibrators can be attached quickly and easily to match-plates, sand hoppers, flasks, and other foundry equipment to deliver powerful vibration anytime and everytime it's needed.

Available in 8 sizes, with piston diameters ranging from ½ to 2½ inches, Series 76 vibrators feature a **special bronze alloy cylinder liner** that provides permanent piston lubrication and greater operating efficiency.

SPO vibrators start instantly with full power and deliver from 2200 to 6000 impacts per minute on standard 80 p.s.i. line pressure, depending upon piston diameter. Both piston and cylinder ends are uniformly hardened to resist powerful blows and to assure a longer, trouble-free service life.

SPO offers a complete factory-rebuild service, **at cost,** which is guaranteed to make your **SPO** vibrators good-as-new. Send your **SPO** home for repair . . . and it will perform at peak efficiency for years . . . and years . . . and years.

SPECIFY SPO FOR POWERFUL, DEPENDABLE VIBRATORS

WRITE FOR CATALOG

SPO INCORPORATED

6449 GRAND DIVISION AVENUE • CLEVELAND 5, OHIO

(*Continued from page* 192)

tion of the bird on the platform, there is no place in Ireland 40 miles from a railroad. How do I know?

"When I was in the Service I marched from one end of the country to the other end. When a garrison was shifted in those days the men walked. I can't say I was very enthusiastic about the system in those far away days. Looking back now I am willing to admit it was a great builder of physical perfection."

He flexed his arms and if possible stood a little straighter.

"At one time or another I tramped from Malin Head in the extreme North to Cape Clear in the South, the last little bit of the owld sod glimpsed through teary eyes by millions of emigrants. Catty corner across the country, I have walked from Dublin in the East to Achill Head, the last bit of land on the West.

"In my well considered opinion, and I'll back the opinion any time, any place with the gloves, bare fists or a reliable old blackthorn, the sponsors did a naughty four letter word, poor job in hiring that lad to talk about his native land. No wonder the country has gone to another naughty four letter word, with the likes o' him traipsing around the world. They should muzzle him, put him in a cage and feed him peanuts."

"Quite interesting," I admitted. "But that is all far away and long ago. Let the dead past bury its dead. Have you had any inquiries recently from a pilgrim or pilgrims seeking the light?"

"Well," Bill said, "now that you have talked me into it, I had a rather peculiar inquiry from a young man in a rural community. I have the document here some place. Listen:

" 'The undersigned is interested in obtaining information regarding the production of nonferrous sand, permanent mold and die castings. Detailed information is not required. Possibly you know of a large foundry that publishes brochures covering nonferrous casting practice. If so will you please ask them to mail their literature to the above address. In event this type of material is not available perhaps you can recommend a textbook on the subject. The textbook should be well illustrated, but not too technical, and contain definitions for terms commonly used in connection with foundry work.' "

"Offhand," I said, "I should say you had to exercise some ingenuity to get out of that trap."

"Trap is right. I suppose I might have ignored the request. That would have been the easy way. However, after thinking it over I wrote

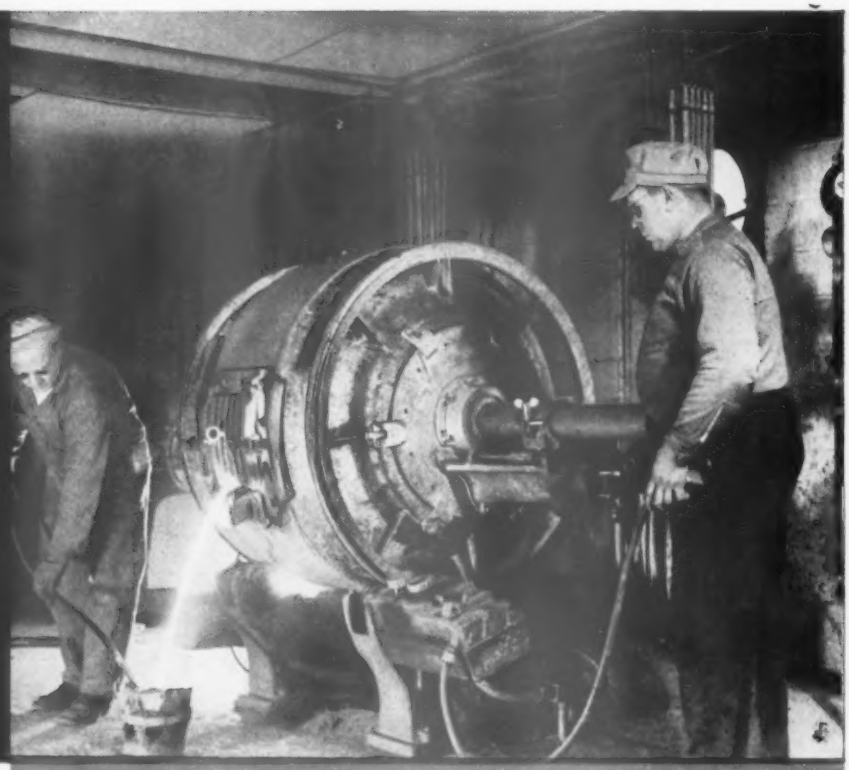
(*Continued on page* 196)

No pigs

in 168,930 lbs. of synthetic alloy iron

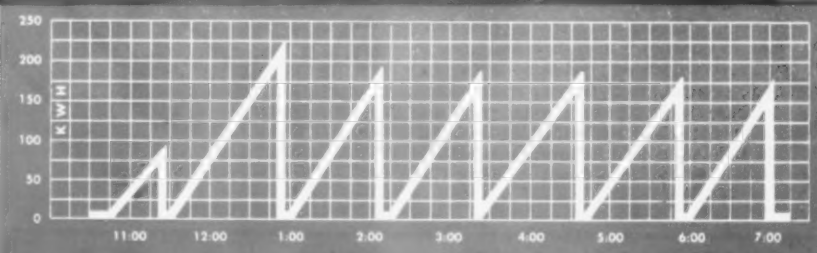
●

A DETROIT ROCKING ELECTRIC FURNACE Melts Scrap with Economy and High Uniformity



No pigs were used in the production of 168,930 lbs. of uniform quality synthetic alloy iron by the Detroit Rocking Electric Furnace shown above. All charges were of scrap and graphite only.

Big savings were made on raw materials. Melt quality and homogeneity were rigidly maintained by automatic control.



One month's operation of type LFY, 175 KW, 700 lb. nominal cold charge capacity Detroit Rocking Electric Furnace. High strength, alloy automotive irons poured at 2800-3000° F.

● No. heats per day—7 ● Av. heat weight—1000 lbs. ● Total lbs. cold melted—168,930 ● Av. power consumption, including preheat—549 KWH/ton ● Total average cost for power, refractories, and electrodes, $11.41/ton.

NOTE: *Operator handles two such furnaces all day. Furnaces are equipped with automatic electrode control as well as automatic rocking control.*

Get Multiple Savings

In your melting operations, you'll achieve better castings, fewer rejects, higher usable yields with Detroit Rocking Electric Furnaces. Faster melts mean more heats per day.

Because the electrodes are always clear of the molten bath, carbon pick-up is eliminated. Indirect arc and automatic electrode adjustment result in optimum power use. All-electric operation excludes costs of handling and storing bulky fuels. Control of interior atmospheres assures peak quality.

Linings last longer. Replacement linings are installed quickly, with least out-of-production time.

Increase YOUR Profits!

Whether you melt ferrous or nonferrous metals, Detroit Rocking Electric Furnaces will give you top melting economies. Send us your production data. Our engineers will furnish facts on how you benefit through better quality control, greater production, with Detroit Rocking Electric Furnaces. Available with conical or cylindrical chambers, in capacities from 10 to 4000 lbs. Write, now, to:

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.

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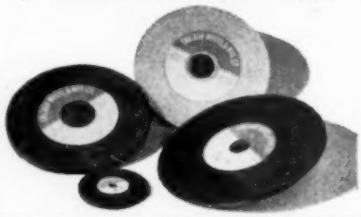
Your HQ For These Foundry Specialties.....

PRECISION CASTINGS

Foundries doing precision investment casting work look to Chicago Wheel for every requirement in abrasive mounted wheels, cut-off wheels and grinding wheels. You'll find them available in a wide range of shapes, sizes and specifications . . . backed by years of experience in de-burring precision castings.

- ✓ Mounted Wheels & Cones
- ✓ Cut-Off Wheels
- ✓ Grinding Wheels
- ✓ HANDEE Portable Tools

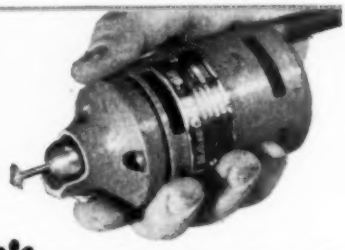


CLEANING AND BURRING ROOMS

For your cleaning and burring operations, look to Chicago Wheel—first and finest in mounted wheels and cones, both Vitrified and Resinoid. Here you get a custom-built product, including every grain, grade and shape of specified structural density to fulfill the most exacting requirements. Keep production up, costs down . . . with Chicago Wheels.

PATTERN ROOMS

HANDEE, the Tool of 1001 Uses, is ideally suited for your touch-up work and smoothing of patterns. For the small jobs and in hard-to-get-at places, you cannot beat the DeLuxe HANDEE. For the heavier jobs, there is the sensational new HANDEE "85." Over 500 accessories to save you valuable time and money.



FREE

BOOKLETS THAT WILL SAVE YOU TIME AND MONEY

Valuable grinding information for your plant! These two booklets, "Safe Speeds For Grinding Wheels," and "Portable Grinding Machines," give your operators, supervisors and others plenty of practical grinding tips. Write today for your plant copies. No obligation.

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Name_____

Firm_____

Address_____

City_____ Zone____ State_____

CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street
Chicago 7, Illinois

(*Continued from page* 194)

him as follows:

If you had supplied certain information, who you are, what you are doing, and what purpose you have in mind, inquiring for information on foundry methods for producing nonferrous castings, I would be in better position to supply an answer.

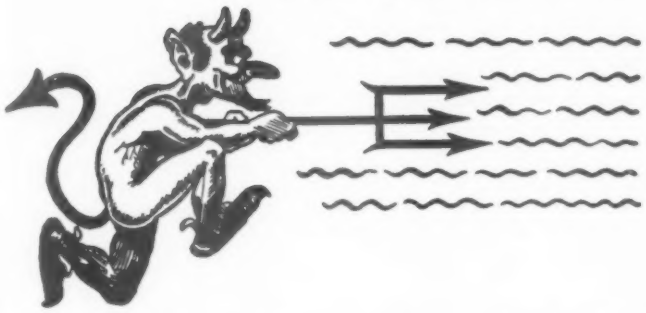
Lacking the foregoing data I shall have to fall back on the imagination and venture a guess. The general impression created by your letter is that you are a high school student, rather above the average since the writing is good and all the words are spelled correctly. Am I on the right track when I suggest that you are preparing a thesis on the subject to be submitted as proof that you are entitled to a degree or a prize of some kind? Offhand and without any particular interest in the subject, I do not favor the general idea. A student cribs some related or unrelated data from a few publications. He knows nothing of the subject in the first place. He learns nothing from skimming through the pages. He is not in position to evaluate the published information, or to know what is pertinent or what is immaterial. To save his immortal soul from perdition two days after the magnus opus has been submitted, he could not give an impromptu summary on the whole theme or on any of the details.

The original idea of preparing and submitting a thesis was sound and sensible. A man was assigned to or allowed to select a definite subject. He was to investigate it thoroughly and then submit his experience and conclusions. His general knowledge was rated by competent authority. Another reason for my impression that you have not yet come into contact with the cruel and practical world is your naive suggestion that I write to several people and request them to send you brochures, etc. Is the paper embargo still in force down your way? Does the local post office refuse to sell stamps? Anything wrong with your fingers to prevent you from grasping a pen? Presumably you are old enough to be familiar with a quaint custom that prevails practically every place. When a doctor, a lawyer, a banker or any recognized authority is asked for an opinion or advice, the pilgrim seeking the light is obliged to cross the learned palm with silver, or preferably with gold. Yet you have no hesitation in asking advice or to request free correspondence service.

THE FOUNDRY maintains a free question-and-answer department as a courtesy and service department for its readers. The fact that you inquire for a book that is well illustrated and not too technical, also a list of foundry technical terms, seems to indicate that you are not a foundryman, that you are not a subscriber, and

(*Concluded on page* 198)

KEEP FEEDING METAL MOLTEN 50% LONGER WITH



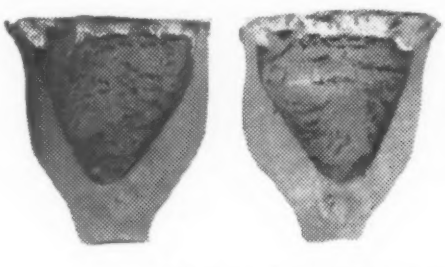
Soffel's

Exothermic CARBON FREE Liquidizer

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is the leader in major foundries for use on ferrous and non-ferrous metals, and in ingot production. It is the first and the original scientific non-carbon exothermic compound for feeding heads and risers.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER is different from ordinary head compounds in two ways: It is CARBON FREE, thereby eliminating carbon pick-up. It is EXOTHERMIC. Carbonaceous materials, regardless of their composition, will cause carbon pick-up, segregation, non-uniform grain structure and hard spots under risers and in castings. Carbonaceous materials contribute no added heat value or increased temperatures to the feeding metal and only act as an insulating cover.

SOFFEL'S EXOTHERMIC CARBON FREE LIQUIDIZER reacts within itself exothermically, producing a temperature above 3200° F. actually increasing the temperature of the feeding metal to a point well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. Shrink cavities in the casting caused by premature freezing of the feeding metal are eliminated. After the exothermic action has ceased, the LIQUIDIZER forms a soft insulating blanket on the metal. This confines the heat generated by the LIQUIDIZER and aids in maintaining the desired high temperature of the feeding metal in the heads.



NOTE THESE TYPICAL RESULTS FROM THE USE OF SOFFEL'S CARBON FREE LIQUIDIZER

This six inch by six inch chrome-nickel-steel riser, with the application of 1 pound of SOFFEL'S CARBON FREE LIQUIDIZER, the average weight was reduced from 32 pounds to 13 pounds, a savings of 19 pounds of saleable metal which normally would have been discarded as scrap, but which was fed into the casting and produced a heavier, sounder casting. Note the feeding head can be knocked off easily saving burning costs. There is no better feeding head compound at any price than SOFFEL'S CARBON FREE LIQUIDIZER.

Soffel's Thermotomic Compound

for all metals and alloys

Patented

SOFFEL'S THERMOTOMIC COMPOUND is an exothermic molding compound which is molded and baked into any desired shapes just as sand cores are made. It is used as ring inserts under the risers or feeding heads and blind riser cracker cores. Also as a facing insert where it is desirable to maintain the fluidity of metal in the mold at those points where rapid cooling may cause piping, shrinkage or segregation. It produces a temperature up to 3500° F. Great savings are realized through the reduction in height of risers as well as the cost of removing feeding heads. SOFFEL'S CARBON FREE LIQUIDIZER should be used on top of the feeding heads in conjunction with the use of SOFFEL'S THERMOTOMIC COMPOUND. For aluminum and magnesium THERMOTOMIC ABC and AL-X31 LIQUIDIZER on top of the heads is recommended. Write for descriptive literature.

BEWARE OF IMITATIONS! We are the originators of CARBON FREE LIQUIDIZER and THERMOTOMIC COMPOUNDS

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WORLD'S LARGEST MANUFACTURERS OF FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS

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If you're on a merry-go-round about handling air or gas, *R-C dual-ability* can help you.

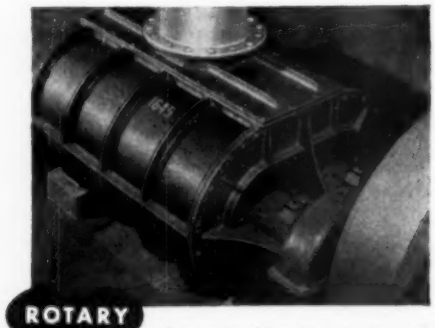
That's been our exclusive job for almost a century. We've developed the most extensive line of blowers, exhausters and gas pumps in the industry, with capacities from 5 cfm to 100,000 cfm.

We're the only builders offering that *dual choice* of both Centrifugal and Rotary Positive equipment. Thus, without bias, we can suggest units that meet most closely the requirements of the work to be done.

For new installations or replacements, look to us for your needs. Alert engineering teams up with modern construction to insure long-time, satisfactory performance of R-C equipment.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Madison Avenue, Connersville, Indiana

Typical R-C Centrifugal Blower suitable for cupola service. Capacity 11,750 cfm.



Rotary Positive Cupola Blower with V-belt drive, for melting gray iron and non-ferrous metals. Capacity 8,600 cfm.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

(*Concluded from page* 196)

that you have no intention of becoming a foundryman. Over a long period of years THE FOUNDRY has presented many articles on the subjects you have listed. Also on several subjects which apparently you have not caught up yet.

Now that I have relieved my mind of certain stray or random thoughts; also to show that in spite of the sourpuss attitude, I have a heart of gold, and presumably other organs of a similar standard quality, I am submitting the names and addresses of a few sources of information as outlined in your recent inquiry.

"I suppose the young man sent you a note dripping with thanks and so forth?"

"Well," Bill said, "I'll tell you. I am reluctantly forced to the conclusion that he is still suffering from arthritis."

New Merchandise Distributors

Whiting Corp., Harvey, Ill., has appointed the following materials handling equipment distributors for its merchandise division to handle its line of electric chain hoists, package and bulk material conveyor systems, overhead monorail and light crane systems and hoist-type cranes: B. A. Hanner, 2365 Beaumont Rd., Columbus, O.; L. A. Jensen, 1020 Ford Ave., Northgate Division, Erie, Pa.; W. C. Stoner, 2617 Gramercy, Houston, Tex.; C. E. Mayo, 5649 Alhambra Ave., Los Angeles; H. A. Mark, 7248 South Talman, Chicago; F. J. Hughes, 342 Madison Ave., New York; F. T. Mackiewicz, 2238 West 21st Pl., Chicago; Gordon D. Hopf, 9 Rittenhouse Pl., Ardmore, Pa.; W. Mattson, 30 Huntington Ave., Boston; C. S. Teeple, 34 Krotiak Rd., Park Forest, Ill.; and S. E. Haslett, 1062 Bryn Mawr, Chicago.

Book Review

The Fracture of Metals, paper, 138 pages, 5½ x 8½ in., published by the Institution of Metallurgists, 4 Grosvenor Gardens, London S.W. 1, England. Price 12s/6d.

This book contains six lectures presented at the September, 1949, Refresher Course held by the Institution of Metallurgists. These include "Cohesion and Rupture in Metals" by N. P. Allen; "Fracture in Creep" by R. W. Bailey; "Fracture under Fatigue Conditions" by H. L. Cox; "Fracture Due to Stress Corrosion" by U. R. Evans; "Effects of Rate Loading on Fracture of Metals" by C. Gurney, and "Brittle Fracture in Mild Steel" by W. Barr.

2 LOW-COST SHORT CUTS TO

better castings

FOR GREEN SAND FACING

"Hercules" NVX can improve your green sand facing four ways. You can get better flowability, better working sand, better molds, and better castings. All you do is merely add one-half of one per cent by weight of NVX to the green sand facing.

You can quickly prove, at small cost, the economy and effectiveness of "Hercules" NVX with a production-scale test. 100-lb. test lots of NVX are now obtainable at the 1000-lb. price.

FOR FERROUS CORE MIXES

"Truline" Binder cuts core room losses. In steel foundries using silica flour, bentonite, or fireclay, it replaces core oil without impairing physical properties. In iron foundries using pitch-compounded mixes, it eliminates pitch. In both cases it gives stronger-handling, more uniform cores; speeds baking up to 25%.

"Truline" Binder also means easier collapsing cores, and up to 50% less cleaning time. Castings come out sounder, truer, cleaner.

"HERCULES" AND "TRULINE" ARE REG. U. S. PAT. OFF.

NF50-2

Jigs and Fixtures FOR THE FOUNDRY

By THOMAS A. DICKINSON

ALTHOUGH most foundries have certain tools which could be classed as "jigs" or "fixtures," few metal-casting firms are now making use of such special production tooling to an extent that could assure an approach to optimum productivity—possibly due to the widespread belief that jigs and fixtures are principally useful as accessories for the machine shop and the large mass-production industries.

It is, of course, true that the value of any special tool is proportional to the amount of production for which it can be used; but it is not true that jigs or fixtures become economically impractical where small-scale fabrication requirements prevail. Aside from the fact that the latter tools can be designed for adaptation to a variety of different manufacturing operations in individual circumstances, costs can be lowered and product quality can be improved through the use of special tooling to:

1. Prevent damage to materials or equipment due to carelessness or human fallibility.
2. Reduce the amount of time required to finish a job.
3. Increase the dimensional accuracy and homogeneity of various products, so that the usual quota of rejections will be greatly reduced.

In other words, the possibility of designing and using a jig or fixture should be investigated whenever it becomes apparent that a task might be accomplished with greater efficiency—from the time work begins on a master pattern until the castings are shipped to a customer.

In the pattern shop, as in other departments of the foundry, special tooling applications can usually be perceived only as the result of careful studies—not first glances. A good example is the master tooling dock used to facilitate fabrication of plaster "mockups" or master patterns for foundry operations at Consolidated Vultee Aircraft Corp., San Diego, Calif.

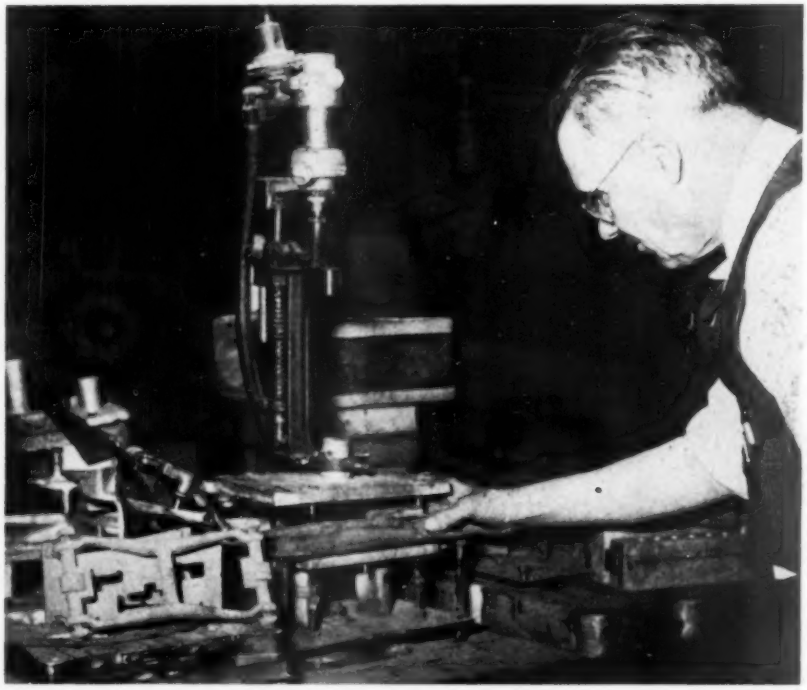
The master tooling dock is a "universal jig," originally developed by Leland A. Bryant during World War II for exclusive use as a three-dimensional positioner for the locational constituents of aircraft assembly fixtures. Its purpose is to make use of transverse, vertical, and longitudinal straightedges (which are analogous to the two-dimensional straightedges used by draftsmen) so that co-ordinate positions in space can be rapidly and accurately established with one-dimensional metal templates which are usually attached to a transverse straightedge. Adaptation of the tooling dock to pattern work is accomplished through use of contour templates in place of the usual positioning templates, so that the following operations can take place within the dock:

1. Positioning a rough steel pattern skeleton in accordance with longitudinal reference points in the dock.
2. Using vertical and transverse straightedges to align contour templates so that the latter can be assembled with proper relationship to the skeleton.
3. Covering the template-skeleton assembly with reinforcing mesh, so that the pattern can be finished by fairing-in with a plaster compound.

Each template thus used is cut to the mold line of the body, and has beveled edges to facilitate its assembly. Mockups are sometimes faired outside of the tooling dock; but, when the lines layout is complex, the usual practice is to use the dock straightedges to guide a scribing "mouse."

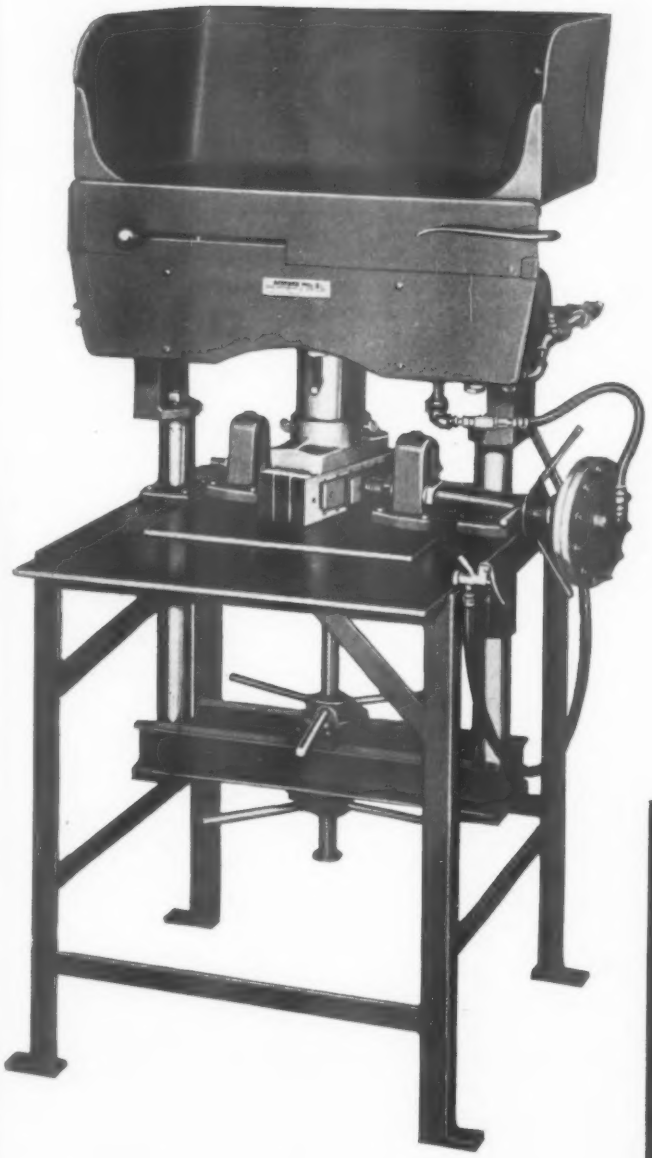
(*Continued on page* 202)

(Above)—Master tooling dock used as a universal jig or fixture. A—Location template. B—Transverse straightedge



(Right)—Pneumatic jig used to trim sand cores at G-B Brass & Aluminum Foundry Inc., Los Angeles

Redford CORE BLOWERS



REDFORD NO. 2 STATIONARY MAGAZINE TYPE CORE BLOWER . . . . .

New standards are being set with this machine, because every motion of your operator has been correctly evaluated to obtain a maximum of production with a minimum of effort.

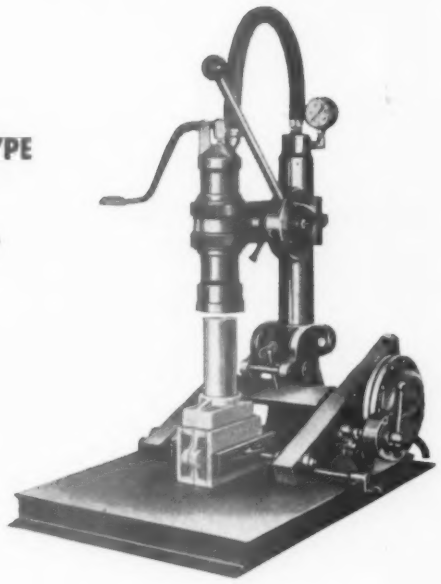
8 OUTSTANDING FEATURES:

1. Large stationary work area.
2. Large sand supply hopper.
3. Stationary sand magazine.
4. Easy accurate locating of core boxes.
5. Quick change magazine heads.
6. Quick adjustment for different height core boxes.
7. Quick change, fully adjustable, vertical clamping attachment.
8. Actuating one handle clamps the core box, blows the core and releases the core box, in two seconds.

CAPACITY: Cores up to 5#

Write for Specification Bulletin "F"

REDFORD CARTRIDGE TYPE BENCH CORE BLOWER . . . . .



The original small core blower . . Proven simplicity, speed and flexibility. Makes cores up to 2#.

Thousands in use in American Foundries . .

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AMERICA'S LARGEST PRODUCERS OF ALLOYS

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NO. 14 ALLOY

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Solid Brass and Bronze Castings

If you make bronze castings to withstand pressure, use "FALLS" No. 14 ALLOY and save 5 to 50% of the castings that would be rejected on account of leakage after machining.

—reduces casting losses due to porosity in composition, valve metal, bronzes, etc.

—deoxidizes—by reducing Metallic Oxides.

—densifies—by producing a close grained structure.

WRITE FOR COMPLETE DETAILS

NIAGARA FALLS
Smelting & Refining Division
Continental Copper & Steel Industries, Inc.
BUFFALO 23, NEW YORK

(*Continued from page* 200)

Numerous efforts have been made to distinguish "jigs" from "fixtures" in terms of tooling functions; but as yet no specific definition of either word is generally recognized, and for most practical purposes "jig" may be used as a synonym for "fixture" in describing any structure which is designed to hold or align component parts or tools for fabrication purposes.

A good example of the usefulness of jigs and fixtures in foundry work was recently encountered in the form of a pneumatically-operated tool for the removal of flash or fins from sand cores at G-B Brass & Aluminum Foundry Inc., Los Angeles. This tool is adaptable to work with cores of virtually all types through the installation of different flash-removal dies therein, and its operation is similar to that of a pneumatic press.

Machine Uses Two Dies

Two identical dies are required to remove flash from cores of a single design, and each die is a steel plate routed or blanked to the deflashed dimensions of a core. One die is mounted on an overhead platen, so that it can be moved up and down with the ram of an air cylinder, while its mate is horizontally mounted in a stationary position over a spring-actuated platform.

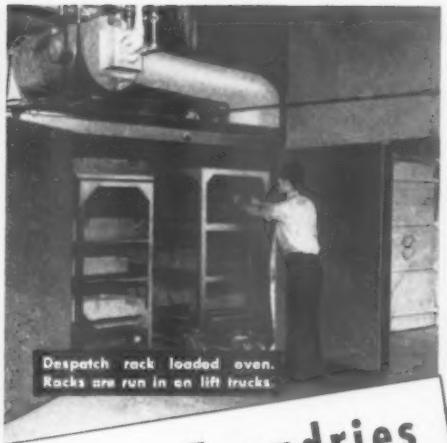
Cores are respectively loaded in the cavity formed by the lower die and the spring-actuated platform, and dowels on the face of the upper die are situated to project through orifices in the mating tool—causing the platform to move downward, and thus preventing the use of pressure on the cores when the dies are closed to remove flash.

With danger of core damage minimized, many G-B cores are being molded without reinforcing wires. The company officials say the jig permits one worker to deflash more cores—with fewer losses due to improper trimming or breakage—than could five employees with manual tools working in a proportionately larger amount of plant space.

Jigs and fixtures for handling purposes, sometimes called "cradles" and "dollies," are among the most practical tools in all industries because they permit the movement of materials, equipment, and products or product parts with maximum speed and minimum damage. Typical of tools in this category used in foundry work is the pattern-lifting fixture shown in an accompanying diagram; it was developed by Morris P. Kirk & Son, Inc., Los Angeles, and its purpose is to facilitate the drawing of

(*Continued on page* 204)

Despatch vertical type, continuous conveyor oven for limited floor space.



Despatch rack loaded oven. Racks are run in on lift trucks.

Core baking horizontal conveyor type oven in the Oliver Foundry.

Despatch mold drying and core baking car type oven.

Despatch rolling drawer type oven. Ideal for large or small cores.

Continuous conveyor leaving Despatch overhead core baking oven in J. I. Case Foundry.

Nation's Leading Foundries Bake Cores—Dry Molds Better, Faster and at Greater Savings with DESPATCH FOUNDRY OVENS

Many foundries using DESPATCH Ovens report improved core and mold quality with a minimum of rejects, reduced fuel cost up to 57% by actual test and increased output up to 70% with the same floor space. These advantages and many others are achieved with the DESPATCH system of convection heating and air circulation. Core baking and mold drying are more uniform because of the equal distribution of heated air to each unit of the load . . . it is done faster because heat transfer is speedy and moisture and fumes are removed quickly.

DESPATCH heating systems are designed to supply adequate heat for highest possible core and mold oven efficiency, whether gas, oil or electricity is used. DESPATCH Foundry Ovens are engineered and built to fit every core baking and mold drying operation. Several types are shown, and there are many combinations to fit the production and space requirements of all foundries.

DESPATCH engineers will analyze your core baking and mold drying problems and make their recommendations to save you production time at the lowest practical cost of installation. There is no obligation for this engineering service.

WRITE TODAY for Bulletin 31J or request a representative to call.

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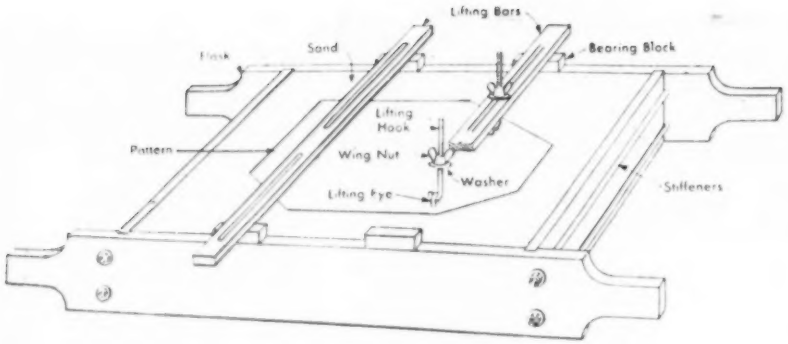
DESPATCH OVEN COMPANY



Pattern lifting fixtures facilitates the drawing of patterns

TRANSITE CORE PLATES are lighter, stronger, resist warpage.

● Core makers can handle more Transite* Core Plates at one time, thus make fewer trips. That means faster production with less fatigue and fewer accidents. Transite Core Plates offer all these advantages:

They Last Longer—Made of fibrous asbestos and cement, Transite Core Plates resist shock . . . are less likely to crack or break.

They Clean Easily—Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.

They resist Corrosion and Warpage—Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.

They are Economical—Low price, low maintenance and long life add up to low cost.

To eliminate green cores and reduce baking time perforated plates are also available.

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JM PRODUCTS

* Reg. U. S. Pat. Off.

Johns-Manville **TRANSITE CORE PLATES MADE OF ASBESTOS**

(*Continued from page* 202)

patterns.

This fixture is nothing more than a wood or metal strip with a slot in which a lifting hook can be positioned and adjusted by means of a wing nut so as to engage a lifting eye on the pattern. Two or more fixtures may be required to lift a single pattern, depending on the size and shape of the latter, and the fixture or fixtures may be manually elevated or attached to an overhead hoist for perfect vertical alignment of the pattern as it is lifted from a sand cavity.

In the use of magnetostriction generators for the degassing of cast alloys, very good results have been obtained by ultrasonic research workers by mounting the transducer elements on overhead fixtures so that high-frequency vibrations could be dispersed directly in molten materials within the molds by means of agitator rods or tubes. This reportedly involved a loss of vibrational intensity, but that was a negligible factor since sound waves of high intensity are not usually essential for degassing purposes.

Seal and Test Castings

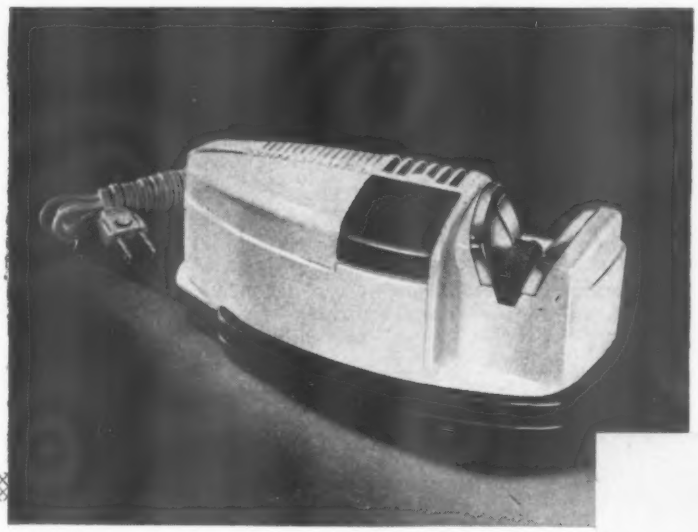
Jigs and fixtures for the machine shop and for assembly operations will not be discussed in this article, since they are not directly related to foundry operations and are fairly well known in their respective fields. However, at least a brief word should be said in closing with regard to the potentialities of special tooling in connection with secondary techniques such as the sealing and testing of castings.

For instance, in the sealing of castings with metallizing or metal-spray equipment, lathe-type tools and fixtures often are useful in supporting and rotating the casts so that the alloy sealants can be applied in a uniform manner. Similarly, in the use of pressure equipment for impregnating castings with resinous sealants, special holding jigs have been used to remove castings from the pressure chamber so that the sealed products could be quickly conveyor-mounted for rapid drying or curing.

Efficient testing or checking fixtures simultaneously provide for the rapid loading or unloading of specified products and for the foolproof usage of commercial test or inspection equipment. For example, in the air-testing of castings for leakage, a simple clamping fixture has been used to maintain an airtight connection between each product and a compressed air line so that there would

(*Concluded on page* 206)

ANOTHER DIE CAST PRODUCT MADE BETTER ON KUX DIE CASTING EQUIPMENT



Die Castings
MADE ON
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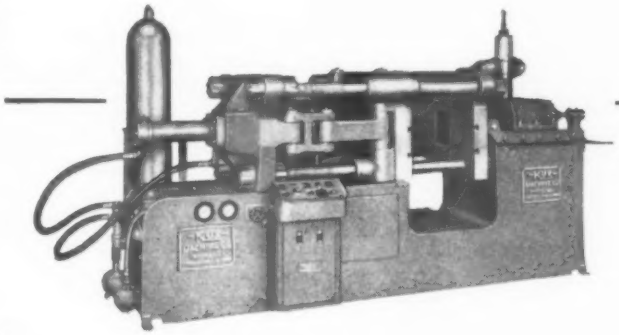
BOOST CONSTRUCTION EFFICIENCY
IN THE MANUFACTURE
OF THE new Cory

ELECTRIC KNIFE SHARPENER

To add to this product's unique, knife-sharpening efficiency, die castings equally functional and sales-attractive are used. The choice of KUX Machines for the production of these die castings was a natural one.

Many other leading manufacturers have learned to rely on modern KUX machines . . . for substantial economies of production . . . improved product appearance . . . superior performance . . . advantages gained from quality die castings made on KUX Die Casting Machines.

There's a machine to solve *your* particular die casting problem! Write for illustrated catalog showing complete line of KUX Die Casting equipment.



MODEL BH-30 ILLUSTRATED

Hydraulically operated die casting machine for production of zinc castings weighing up to 10 pounds.

KUX MACHINE COMPANY
3932 W. HARRISON STREET
CHICAGO 24, ILLINOIS

(*Concluded from page* 204)

be no danger of leakage anywhere other than in the critical areas of the casting; also, in the tensile seting of test bars, it is often desirable to make use of alignment jigs so that the accuracy of test data will not be impaired by the application of unequal increments of force.

Bibliography

Bryant and Dickinson, Jigs and Fixtures for Mass Production, published by Pitman, New York, 1947.

Colvin and Haas, Jigs and Fixtures, published by McGraw-Hill, New York, 1943.

F. D. Jones, Jig and Fixture Design, published by *Machinery*, New York, 1942.

FRENCH FOUNDRYMEN REPORT

On American Practice

UNDER the sponsorship of the Economic Co-operative Administration, Washington, eighteen representatives of the French foundry industry visited gray iron foundries in the United States during 1949 to gain technical knowledge of molding and metals, standardization and quality improvement, modernizing equipment and training of employees. Paul Chatelin, technical administrator of French Foundries, who headed the group on its tour, reported its findings in an address before the Association Technique de Fonderie recently.

Mr. Chatelin pointed out that average production of castings in the United States is 2.7 tons per man per month while in France it is 1.1. Reasons for the high rate of productivity, he believes, can be divided into three categories: Economic, social and psychological, and technical.

Taking first the economic reasons, financial stability allows an effective depreciation of new plant and equipment. Also, loans at low interest rates make financial backing available for fundamental alterations or new enterprises. Taxation is not such that it discourages individual enterprise. Another factor is the American market which, by heavy consumption per person, provides big demand and permits high productivity. Other economic considerations are the existence of huge resources of raw materials and the ready availability of power at a much cheaper cost than in France.

Foundries Operate Smoothly

Conditions of work and the specialization by companies provide some of the psychological and social reasons. Workers' unions, which create a better reciprocal understanding between the employer and the employee, must also be taken into consideration. Large-scale organization is assisted through training of management representatives and foremen chosen from the ranks of production employees; and better discipline of the individual in America aids in the smooth and efficient operation of the foundry.

There are many technical reasons for the high productivity. The fact that open-land often is available enables the manufacturer to construct buildings designed for their ultimate use. On the human level time and motion study is given considerable attention with the result that simple operations are made without haste and wasted motion and effort are eliminated. Preparation of work is made under a technical and administrative plan. Also there is decentralization of responsibilities. One person is made responsible for a particular job for which he is specially qualified or trained and he devotes all his physical and mental abilities to that one task.

Another technical factor is the ad-

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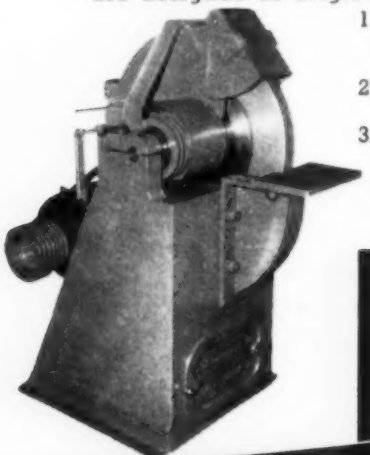
FOR THE FOUNDRY

Three important reasons why FOX Grinders are designed as single-wheel machines:

1. Speed changes can be made at the proper wheel diameter.
2. Less space is required for each installation.
3. Proper operating room is provided on either side of the wheel.



FOX

HIGH SPEED
STAND GRINDERS

These Stand Grinders have been designed for use in foundries where high-speed production is required. Maximum clearance at the grinding face has been provided in both units to properly take care of the innumerable casting shapes encountered throughout the foundry industry.

Comes in 4 sizes: 20" light duty—24" light duty—24" heavy duty —30" heavy duty.

FOX GRINDERS, Inc.

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vanced mechanization which can be attributed to the economic conditions mentioned earlier as well as to the genuine desire of employers to reduce worker fatigue. American foundrymen seek above all to eliminate useless handling and to lighten that which cannot be avoided. Average age of machinery in the United States is from 5 to 7 years while in France it is 20 years. Close controls are maintained on all grades of molding sand and on metals through chemical analysis.

Technical knowledge is widely disseminated in America, due in a large part to the complete freedom allowed by manufacturers for exchange of manufacturing processes and ideas.

The suggestion box has proved successful. All suggestions submitted are examined carefully and if rejected the worker is given the reason. On the other hand, if it has the slightest value, he is rewarded according to a definite scale. Wages are based on standards which take into consideration effort and skill rather than actual timing. These standards also contribute to the organization of work. Relations between the customer and foundryman appear to differ from those in France. The customer, patternmaker and foundrymen study closely molding problems in connection with the production of castings and this often results in the simplification of design.

The conclusion reached by the French productivity team was that greater productivity is achieved in the United States by more methodical application of techniques which are already known in France rather than by the employment of super-technical processes.

Book Review

Casting of Brass and Bronze, by Daniel R. Hull, 186 pages 5¾ x 9 in., published by the American Society for Metals, Cleveland. Price, $3.50.

Similarity of terms in different industries frequently leads to some confusion. While the title could indicate the processing of copper-base alloys into sand or permanent molds to produce cast parts, it also could mean the pouring of brass and bronze into ingots to be used for various rolling mill processes. This book deals with the latter. However, it presents information which should be of interest to foundrymen, including discussions on melting, the use of oxygen, hydrogen and deoxidizers, and the handling of tin bronzes.

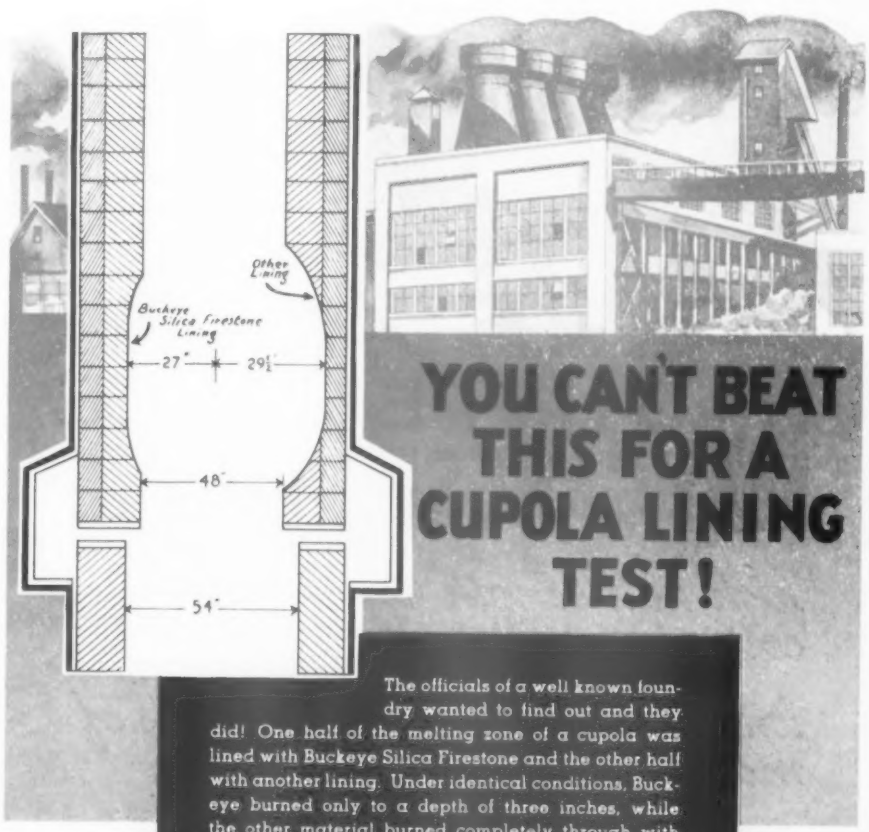
The author, who is assistant technical manager, American Brass Co., has confined his discussion largely to the presentation of his own observations and experiences in the practical aspects of brass and bronze casting in America over a period of 50 years.

Book Review

Rating Employee and Supervisory Performance, edited by M. Joseph Dooher and Vivienne Marquis, paper, 192 pages, 5½ x 8½-in., published by American Management Association, New York 18. Price $3.75.

How to rate subordinates and how to evaluate other men's ratings of those they supervise are explained in this manual. The principles and procedures apply to a variety of industrial, white-collar, and professional employees in large and small companies.

Fourteen authorities are represented in this manual which draws from the best material published on the subject by AMA. A section reproduces 26 selected merit rating forms in current use in business and industry, and analyzes the various approaches generally utilized in evaluating personnel.



YOU CAN'T BEAT THIS FOR A CUPOLA LINING TEST!

The officials of a well known foundry wanted to find out and they did! One half of the melting zone of a cupola was lined with Buckeye Silica Firestone and the other half with another lining. Under identical conditions, Buckeye burned only to a depth of three inches, while the other material burned completely through with one inch of the backing, next to the shell, also being destroyed!

There is no guesswork when you specify and use Buckeye. You **know** it will do a better job. Its successful application in hundreds of foundries is proof of its importance in your own cupola! Write for full information contained in Bulletin 63.

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PURDUE FOUNDRY CONFERENCE

Program Announced

PROGRAM for the third annual Metals Casting Conference, to be held Nov. 2-3 at Purdue University, West Lafayette, Ind., under the sponsorship of the university and the Michiana and Central Indiana Chapters of the AFS, will cover a number of subjects of interest to both ferrous and nonferrous foundrymen.

A new feature of the conference this year will be an educational display of castings together with photographs showing the processes, equipment and foundries where the castings were made. One purpose of the exhibit will be to show engineering students the importance of the foundry industry. Display entries being accepted by the exhibit committee, and information concerning them may be obtained from the committee chairman, Verne S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

The conference program includes:

Thursday, Nov. 2

9 a.m.—Registration.

10 a.m.—Welcoming address by Dr. Frank C. Hockema, executive dean, Purdue University; response by Stowell C. Wasson, National Malleable & Steel Castings Co., Cicero, Ill. L. L. Andrus, American Wheelabrator & Equipment Corp., Mishawaka, Ind., chairman.

11 a.m.—"Recent Engineering Developments in the Foundry Industry," by Fred Carl and J. J. McClain, Allison-Bedford Foundry Division, General Motors Corp., Bedford, Ind. Prof. H. A. Bolz, General Engineering Department, Purdue University, chairman.

1:30 p.m.—"Good Casting Design—on Purpose!" by William T. Bean Jr., Industrial Electronics Inc., Detroit. Lewis Reiff, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., and G. W. Bergren, assistant professor of mechanical engineering, Purdue University, co-chairmen.

3 p.m.—"Current Status of the Foundry Educational Foundation," by E. W. Horlebein, Gibson & Kirk Co., Baltimore. George K. Dreher, executive director, Foundry Educational Foundation, Cleveland, and Paul Harlan, Electric Steel Castings Co., Indianapolis, co-chairmen.

6:30 p.m.—Banquet speaker, Leroy P. Robinson, Werner G. Smith Division, Archer-Daniels-Midland Co., Cleveland. William Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., toastmaster.

Friday, Nov. 3

10 a.m.—"Fluid Flow," motion picture produced for the AFS Aluminum & Magnesium Division at Battelle Memorial Institute, Columbus, O. Comments by S. C. Massari, technical director, American Foundrymen's Society, Chicago. Allen J. Reid, General Refractories Co., Indianapolis, chairman.

11 a.m.—"Gating and Risering," by Norman A. Birch, American Brake Shoe Co., Meadville, Pa. S. Franklin Swain, Golden Foundry, Columbus, Ind., and Robert Spurgin III, Swayne-Robinson & Co., Richmond, Ind., co-chairmen.

1:30 p.m.—"Fundamentals of Foundry Sand," by R. P. Schauss, Illinois Clay Products Co., Chicago. Prof. C. T. Marek, Purdue University and Robert Greenlee, Auto Specialties Mfg. Co., St. Joseph, Mich., co-chairmen.

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MANGANESE BRONZE

high in strength, toughness and corrosion resistance.....

long time favorite with mfrs. of marine fittings.....

leaves sand clean and bright—takes a mirror-like finish.....

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AJAX METAL DIVISION

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Book Review

Materials Engineering of Metal Products, by Normann E. Woldman, cloth, 583 pages, 6 x 9⅜ in., published by the Reinhold Publishing Corp., New York. Price $10.

The author of this work, who now is a consulting metallurgical engineer, is well known in the foundry industry. The volume is a companion book to *Metal Process Engineering* published in 1948 and concerned with different metallurgical and mechanical processes for fabricating metal parts, including casting.

This volume presents the materials used in various types of industries and different applications in an attempt to correlate metallurgy of the material with engineering design and service applications. The contents include sections on materials for light weight construction, materials for mechanical products, materials for electrical industries, materials for special and severe service, and on testing.

Effect of Hydrogen on Some Aluminum Alloys

(*Continued from page* 109)

are almost as dangerous as the more voluminous (but not more extensive) fissures of Fig. 3.

It was interesting to note that there was a definite relationship between the appearance of the fracture and the mechanical properties. When the test bars from heats *A*, *F*, and *G*, which contained very little gas porosity, were pulled, the resulting fracture was fine grained and even. All the test bars from the other heats had a coarse uneven fracture common to metal that fails in part in the dendrite or grain boundaries. Figs. 5 to 8 illustrate the marked difference in the fractures. Although there appears to be a great difference in the grain size of the gassed and degassed heats, on the basis of fracture, etching of a polished section from each specimen near the point of fracture showed all to have the same grain size. It is concluded, then, that the rough fracture is common to gassy metal and is due to partial interdendritic failure in the fracture cross section. The appearance is suggestive of fish eyes in steels.

The poor mechanical properties of heats *B*, *C*, *D*, and *E* are attributed to the interdendritic type of porosity. Although heats *C*, *D*, and *E* are less dense, their properties are not significantly worse. The increased degree of porosity in these three heats is due to larger macroscopic cavities that were just visible to the naked eye. Indications are that the small hairline cavities with high surface-to-volume ratios are the real troublemakers and that these can be formed even though the gas content of the molten metal is less than that necessary to produce obvious pinhole porosity. Thus an aluminum alloy that appears sound to the naked eye may have an interdendritic network of microscopic cavities which greatly reduces the sound cross-sectional area. Only very careful melting and degassing practice can prevent this detrimental type of gas porosity.

Conclusions

1. There is no evidence that dissolved hydrogen embrittles aluminum. Hydrogen either is not soluble in the aluminum lattice to an extent great enough to cause distortion or it comes out of solution before a test of the physical properties can be made.

2. An aluminum cathode in a sodium hydroxide electrolyte or aluminum pickled in a sodium hydroxide solution will absorb an amount of hydrogen appreciably greater than the equilibrium amount for solid aluminum. The maximum dissolved was 0.56 cc per 100 grams of aluminum.

3. An aluminum cathode in an acid electrolyte will not absorb a measurable amount of hydrogen.

4. Hydrogen which precipitates interdendritically when aluminum solidifies, markedly weakens the metal. Amounts of hydrogen less than that necessary to produce some pinhole porosity will yield microscopic interdendritic cavities which will decrease greatly the tensile strength and elongation of a 5 per cent silicon-aluminum alloy. Hydrogen trapped as spherical bubbles is probably not as damaging to the mechanical properties.

5. Interdendritic gas precipitation is indicated by a rough fracture having the same appearance as the fracture of a coarse grained metal or the fish eyes of hydrogen-embrittled steel.

Acknowledgment—The authors wish to express their thanks and appreciation to Miss Edith Weiser for her assistance during this research and to the Bureau of Aeronautics

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who sponsored the research, of which this is a portion.

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Plans Cupola Class

Philadelphia Chapter of the American Foundrymen's Society will conduct a Cupola Shop Practice Course Oct. 11-13 at the University of Pennsylvania, Philadelphia, under the instructorship of B. P. Mulcahy, Fuel Research Laboratories Inc., Indianapolis. On the third day the class will visit the Philadephia coke plant.

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Determining Magnesium In Cast Iron

(*Continued from page* 93)

on a 9-cm close-textured paper containing a little paper pulp and wash thoroughly with cold ethanol wash solution. Ignite in a platinum crucible, first at a low temperature and finally at 900° to 1000° C for 10 minutes. Cool in a desiccator and weigh as $CaSO_4$. Calculate to the equivalent weight of $Ca_3(PO_4)_2$ (by multiplying the weight of $CaSO_4$ by 0.76).

To calculate for magnesium:

$$\text{Magnesium, per cent} = \frac{(A-B) \times .2184}{C} \times 100$$

where:

A = grams of pyrophosphate precipitate.

B = grams of $Ca_3(PO_4)_2$.

C = sample weight in grams.

Discussion and Results—The results obtained on synthetic mixtures, prepared by adding known quantities of magnesium to a standard iron, given in Table I indicate an accuracy of the order of 0.002 per cent of magnesium in the range of magnesium content from 0.01 to 0.10 per cent. The results of replicate determinations obtained on six irons containing varying quantities of magnesium, given in Table II are typical of a number of samples analyzed during a period of six or eight months. All values given were determined by using 10-gram sample weights, and most of the replicate determinations on any sample or synthetic mixture were obtained in different "sets."

Several of the NBS standard samples of iron, number 4g, 5h, 6e, 82a, and 107a, were examined for magnesium and found to contain negligible (0.002 per cent or less) quantities. Additions of 0.05 per cent of magnesium to these same irons were re-

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covered within the limits illustrated in Table I, indicating that the method is applicable to most plain or low-alloy irons. In addition, it will also be noted from the data in Table I that moderate amounts of calcium and cerium do not interfere. The amounts of calcium recovered in the purification of the magnesium pyrophosphate precipitates varied from none to 3 mg of $CaSO_4$ per run on irons containing no added calcium. The cause of this variation in the recovery of calcium was not established but may be due, in part at least, to solubility effects on glass equipment.

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Studies Soil Pipe Specifications

Cast Iron Soil Pipe Institute is studying specification requirements for cast iron soil pipe and fittings for the purpose of releasing industry-wide standard specifications supplementary to those already in effect for the extra heavy grades. Work of the institute, which represents 27 major manufacturers in the industry, will be broadened this year to include employment of field men who will supply technical and other information to those allied with the construction industry and public health dements.

Book Review

How To Plan Pensions, by Carroll Boyce, 479 pages, 5½ x 8 in., published by the McGraw-Hill Book Co. Price $5.

The subject of pensions has been receiving so much attention that this guidebook for business and industry should prove interesting and valuable. The work is intended to give background information for the person who must decide pension policy, for the pension negotiator, for the man who sits on a pensions committee, and for the man who must handle pension grievances. An appendix gives comparisons of different plans used by large organizations and the text of a number of pension agreements.

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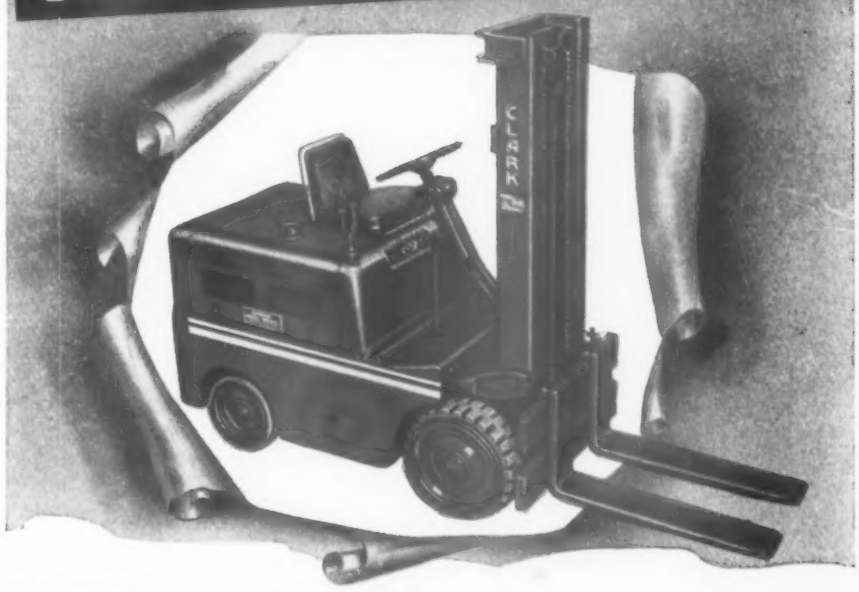

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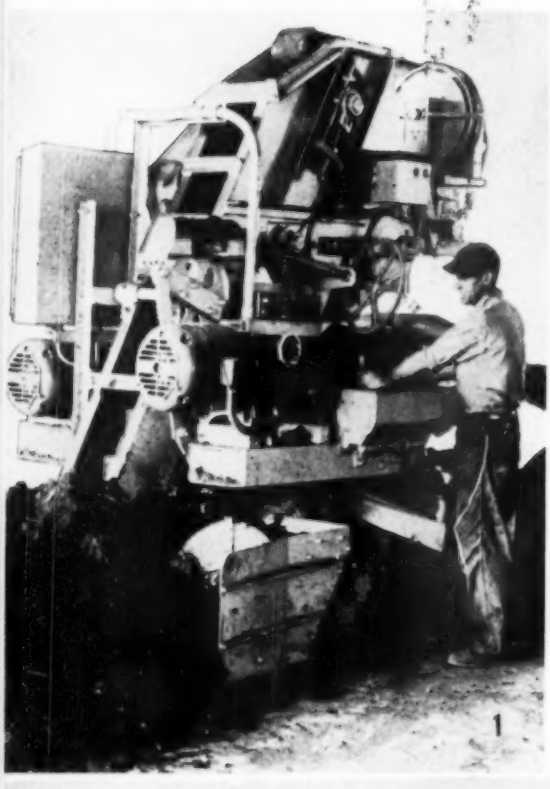

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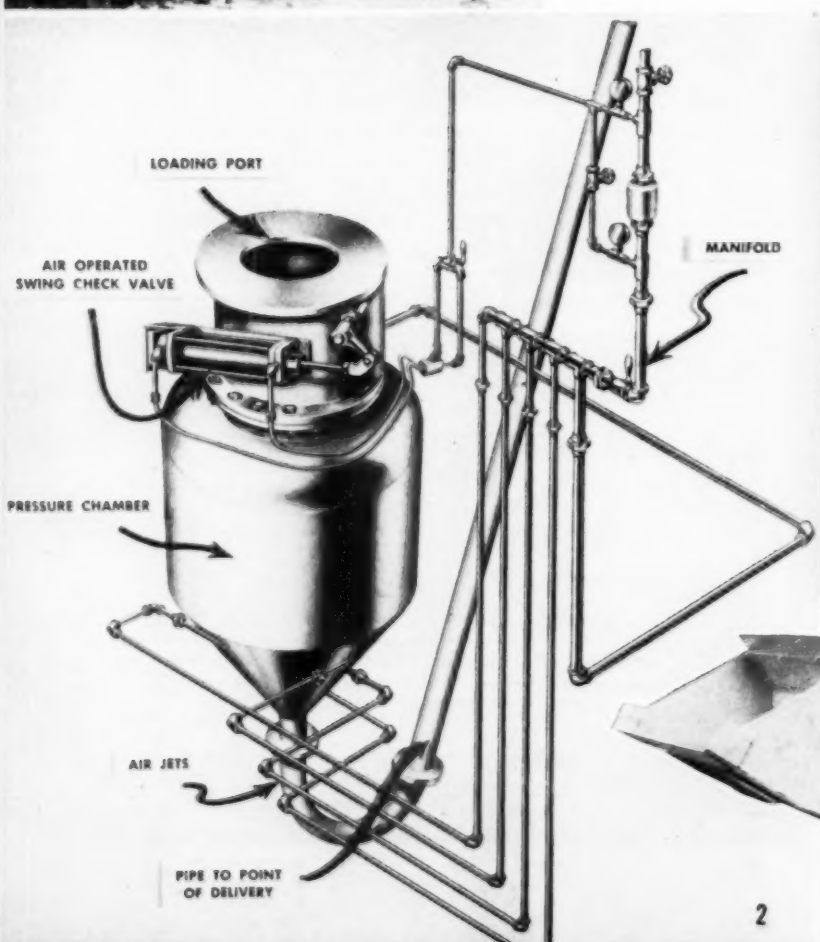
(1)—Sand Conditioner:

Beardsley & Piper Division of Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39—Motive sand preparation unit has been redesigned with 20 improvements which provide greater capacity and smoother, more efficient operation. The machine now has a capacity of 50 tons per hour of blended, iron-free, screened and aerated sand. Requiring only one operator, the machine moves under its own power while loading or traveling from floor to floor. A rotating spiral blends shakeout sand and additions and conveys the mixture to a bucket elevator where it is further blended as it is discharged over a magnetic separator. This sand is screened and aerated and then discharged into pile, bin or windrow. Adjustable discharge spout permits discharge of sand to any distance within 50 ft and in any direction within an arc of 240 degrees.

For More Details Circle No. 1—Page 215

(2)—Pipe Line Conveyor:

Crane Co., 836 South Michigan Ave., Chicago—Pipe line conveyor operates from air pressure. It consists of an entrance or swing check valve through which the material to be transported is loaded in the pressure chamber, and pipe, bends, switches and fittings necessary for delivering the material to point of use. Air pressure is controlled by a manifold incorporating several valves and a pressure regulator. It is designed for batch moving of sand or other granular, crushed, or pulverized materials. Entire system is controlled by one operator at the storage or mixing source. Dispatch to more than one location is possible through use of a transfer switch. Conveyor is available in 7, 15, and 30 cu ft capacities. Air pressure required for operation depends upon the materials, size of batch, and distance to be moved. In one foundry a 900-lb batch of mixed core sand is transported 40



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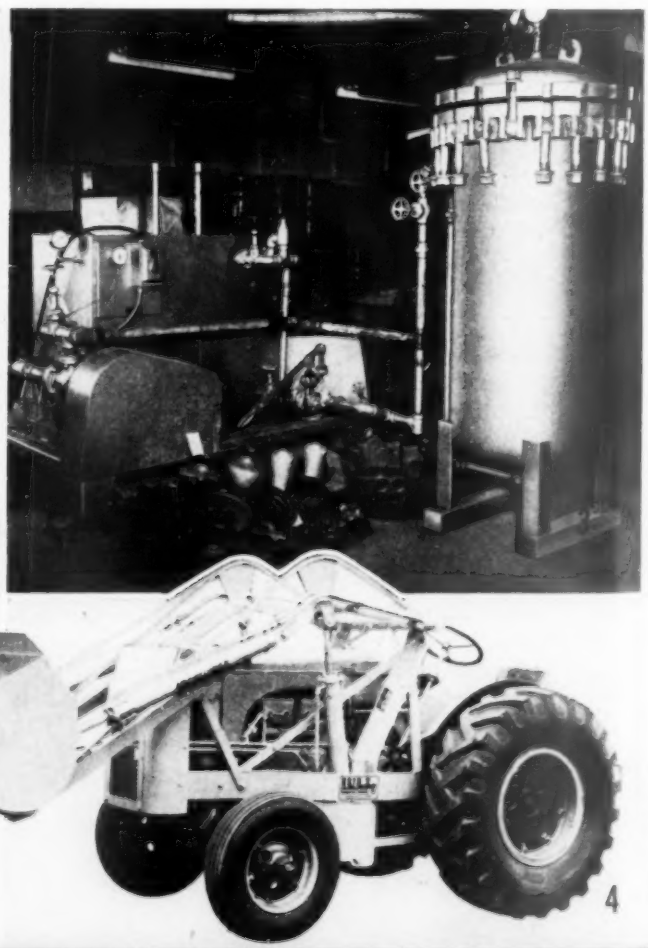

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ft vertically and 50 ft horizontally every 30 to 45 seconds with air pressure of 40 psi. Test data indicates that 1 cu ft of air will deliver approximately 3 to 4 lb of sand.

For More Details Circle No. 2—Page 215

(3)—Porosity Treatment: Tincher Products Co., 840 Borden Ave., Sycamore, Ill.—High-pressure equipment, for reclaiming porous castings that must withstand liquid or gas pressures, permits porosity-elimination treatment of small cast parts in bulk. The new device treats all internal and external surfaces simultaneously. Either before or after machining, the cast parts are placed in a wire basket which is lowered into the tank. When the cover is secured, the sealing agent used in the process is forced into the tank. The high pressure created forces the sealant into pores and voids in the castings. It is claimed that the castings do not require washing or curing after treatment and no evidence of impregnation remains.

For More Details Circle No. 3—Page 215

(4)—Tractor Shovels: Lull Mfg. Co., 3612 East 44th St., Minneapolis 6—Tractor shovels utilize hydraulic power for raising, lowering and dumping. They are available in various models with peak lifting capacities of 3750 to 9000 lb. Lifting heights with bucket bottom horizontal are 9 ft, 11 in. to 11 ft. Dumping heights with bucket in dumped position are 8 ft, 6 in. to 9 ft, 6 in. Forward reach ahead of radiator shield is 66 to 72 in. Overall length mounted on tractor, including ballast box and bucket on ground is 14 ft, 10 in. to 17 ft. The shovels are mounted on industrial wheel type tractors produced by experienced manufacturers. Features claimed are that loader and tractor are properly balanced with most weight on the traction wheels, relieving front axle of strains and allowing easy steering; it will dig below tractor level; it can be equipped with a cab without making alterations, and good vision is afforded the operator with bucket in any position. Machine is designed for digging, lifting, loading, transporting, scraping, and bulldozing.

For More Details Circle No. 4—Page 215

Machine Vise: Van Products Co., 2158 Baldwin Bldg., Erie, Pa.—New air-operated machine vise of simple design is said to have good accuracy, high power, and a long stroke. It uses no levers or wedges; its great power results from a large-diameter cylinder. Adjustable gibs for removing play, which may develop from long, hard use, maintain accuracy of the vise. Stroke of the standard model is 1¼-in. A 6-in. stroke is available for special uses such as pressing, shaping, forming, etc. Jaws are 8⅜-in. wide and open to a maximum of 11 in. The chosen opening is preset by a standard socket head wrench. A safety stop screw prevents jaw movement beyond any chosen spot, and a jam nut holds this adjustment until changed by the operator. Jaws close and open quickly without hammer effect, and the speed of both actions is adjustable, it is claimed.

For More Details Circle No. 5—Page 215

Riser Compound: Metal & Thermit Corp., 100 East 42nd St., New York 17—Exothermic riser compound is designed to eliminate piping in casting risers. Use of the material is said to facilitate production of sound castings by promoting proper directional solidification, reduce special casting design by eliminating many chills and blind risers, and save foundry metal by reducing the volume of riser metal required. Basically, the compound is a mixture of aluminum and iron oxide which reacts, when ignited, to produce pure iron and alumina slag. The reaction generates a temperature of more than 4000°F. Mixtures are available for cast iron, mild steel and various stainless steels.

For More Details Circle No. 6—Page 215

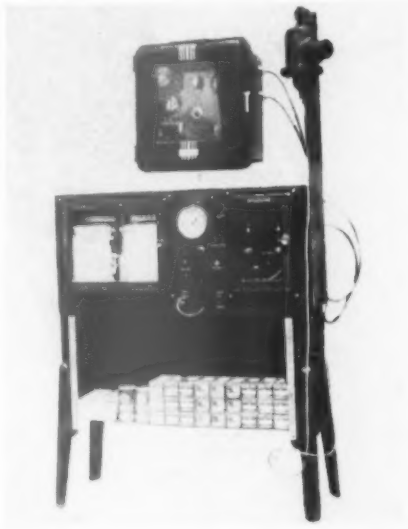
Fire Retardant Paint: Flame-Seal Corp. of Ohio, 663 Spitzer Bldg., Toledo, O.—Fire retardant and non-toxic paint is recommended for use as an interior paint for combustible wood surfaces, cardboard, and various types of fibre partition boards to render them fire retardant. The paint is said to give off no toxic gases while being applied or when exposed to fire. Packed in 1 and 5 gal pail type metal containers, the paint is ready to apply by brush or spraying. It is available in oyster white or seven pastel colors. Company also makes a product for flame-proofing all kinds of fabrics. The cloth to be treated is dipped in a mixture of the product and water.

For More Details Circle No. 7—Page 215

Dual Fuel Burners: North American Mfg. Co., 4455 East 71st St., Cleveland 5—New line of combination gas-oil burners consists of 1, 1¼, 2 and 3-in. sizes. Burners are designed to operate with light or heavy oils and low pressure air as well as gas of any Btu content. Improvements in the line of burners include a new refractory tile which has been redesigned to give greater stability to the flame without danger of carbon formations.

For More Details Circle No. 8—Page 215

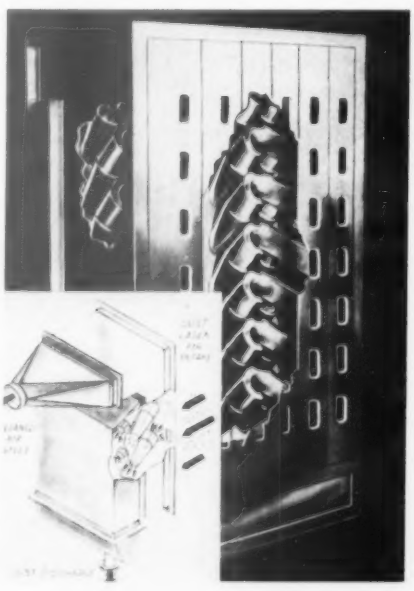
Flame Control: Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.—New model instrument is designed to simplify operation of bessemer converters and provide high accuracy in



determining the end point and controlling the carbon. It enables the operator to determine the silicon, manganese and carbon periods and forewarns him of impending manganese boils, which reduce loss of metal and time. The correct end point is established accurately, eliminating excessive iron oxide. Two dual speed chart recorders provide permanent records of air and flame characteristics. Instrument is equally applicable to side blow or bottom blow converters.

For More Details Circle No. 9—Page 215

Dust Collector: Dustex Corp., 1758 Walden Ave., Buffalo 21—Multiple cyclone-type dust collectors return cleaned air to working areas, and are constructed without moving components or filters. The col-



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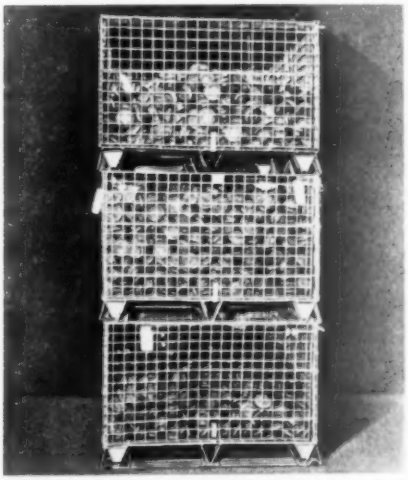
For More Details Circle No. 10—Page 215

Containers: Union Steel Products Co., North Berrien St., Albion, Mich.—Welded steel wire containers have press formed steel supporting base and legs for lift truck entry. They are constructed to stand up



under foundry operating conditions and to carry loads up to 4000 lb. With the sides folded down, the containers occupy only a little more return shipping or storage space than the height of the pallet legs. Containers are fireproof, rust-resistant, and easy to clean. Dirt and foreign matter drops through the mesh. They can be loaded and stacked high with safety because they interlock in tiers, yet are easily handled by fork or hand lift trucks with eight-way entry for easy maneuverability in shipping and storage areas.

For More Details Circle No. 11—Page 215

Air Filter: Keller Tool Co., 1333 Fulton St., Grand Haven, Mich.—New air filter consists of a two-piece aluminum housing containing a porous, sintered bronze filter element designed to remove particles of dust, dirt, grit, or scale down to 0.001-in. in size. A series of baffles in the bottom of the filter unit trap condensation and moisture in a sump from which the accumulated waste can be removed through a drain cock. Filter element is said to be removed and cleaned easily. Unit has a rated

(*Continued on page* 218)

HELPFUL LITERATURE

50. Furnace Linings

A. P. Green Fire Brick Co.—24-page illustrated booklet FT-PC-1 explains facts about application and installation of plastics and castables in fire tube boiler settings.

51. Electrodes

Great Lakes Carbon Corp.—12-page illustrated bulletin "GLC Electrodes" outlines steps taken in producing graphite and amorphous carbon electrodes and anodes. Stock sizes are listed.

52. Cast Steel Flasks

West Michigan Steel Foundry Co.—4-page illustrated bulletin "Cast Steel Flasks" describes integral machined flasks which are equipped with hardened pins and bushings to give rigidity to minimize runouts and shifts. Perforated side walls reduce weight, hold sand in flask and allow mold gases to escape freely.

53. Mold-Making Resins

Union Carbide & Carbon Corp., Bakelite Div.—16-page illustrated booklet is entitled "Bakelite Phenolic Resins for the 'Croning' Process." Powdered heat-reactive phenolic resins are employed as binders for foundry sand in production of both cores and molds.

54. Abrasive Belts

Behr-Manning—4-page illustrated bulletin "What's The Hottest Item in Metal Preparation Today?" deals with applications and uses of coated abrasive belts in metal finishing and preparation.

55. Foundry Products

Foundry Services Inc.—12-page illustrated regular publication "Foseco Foundry Practice" No. 99 deals with defective gunmetal pulley wheel casting, methods of molding sheave pulley, effect of graphite on cast iron and various products used in castings.

56. Industrial Thermocouples

Thermo Electric Co.—8-page illustrated catalog section No. 22 presents line of standard thermocouples, assemblies and parts for all pyrometer applications encountered in industry.

57. Air Compressors

Ingersoll-Rand Co.—8-page illustrated form No. 1048 describes T-series stationary air compressors available as two lines: one designed for normal industrial pressures of 100 to 125 psi; other rated at 200 psi for continuous service and up to 250 psi on intermittent pump-up service.

58. Vibrating Feeder & Conveyor

Hewitt-Robins Inc., Robins Conveyors Div.—8-page illustrated bulletin No. 134 tabulates features and advantages obtainable with Vibra-Feeder which uses mechanical means of operation. Designed with minimum of parts, machine uses only 2-ampere current with its ½-hp motor. Bulletin 135 describes Vibra-Veyor in lengths up to 200 feet which is actuated by same vibrating mechanism.

59. Foundry Information

Whiting Corp.—40-page illustrated pocket-size bulletin FY-140-R entitled "Useful Information for Foundrymen" contains facts, figures, formulas, brick counts, fuel costs and other related data of interest to anyone connected with foundry practice.

60. Mexican Graphite Products

United States Graphite Co.—2-page bulletins No. G-5, 8, 9, 10, 11, 12, 13 and 14 deal with mold coatings, Mexaloy refractory ingredient, hot topping compound, Mexacote all-purpose wet blacking, Mexican graphite for ladle recarburization of steel, Mexican graphite Cordip, industrial uses for pulverized Mexican graphite products and index of various Mexican graphite products.

61. Metal-Heating Furnaces

Johnson Mfg. Co.—4-page illustrated bulletin No. 1100 covers line of oil or gas fired metal-heating furnaces, burners and equipment engineered and built for specific services. Typical units are depicted along with accessory blowers and controllers.

ADDITIONAL INFORMATION?

For additional information on any of the items described under "New Equipment and Supplies", "Trade Publications" or "Helpful Literature" in this issue — simply circle their corresponding item numbers on one of these cards.

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62. Foundry Cores

Archer-Daniels-Midland Co. — 12-page illustrated booklet "Sands, Moisture, Binders—How Do They Affect Foundry Cores?" presents extracts from basic research projects directed toward correlating these factors in standardization of foundry core practices.

63. Blocks & Sheaves

American Hoist & Derrick Co.—20-page illustrated catalog No. 300-6A and 4-page illustrated catalog No. 300-16A list various heavy-duty type blocks and sheaves and High Lift crane blocks available in capacities from 10 to 50 tons, respectively.

64. Core Binders

Monsanto Chemical Co. — 12-page illustrated technical paper "Phenolic Resin Core Binders" is reprint of paper presented by J. E. McMillan and J. A. Wickett at the 54th Annual AFA Convention. Discussed is the effect of core composition on physical properties of cores.

65. Air-Line Filters

R. P. Adams Co.—8-page illustrated bulletin No. 176 describes equipment for removal of water, oil and pipe scale from compressed air systems and protection of air-powered tools, gages and process equipment against air-borne impurities.

66. Refractory Bonding Mortar

E. J. Lavino & Co.—4-page illustrated brochure D-117-A explains composition, properties and applications of Kromepatch chrome bonding cement.

67. Industrial Products

Jeffrey Co. — 48-page illustrated booklet 832 is intended to show industrial products made by corporation and its subsidiaries. Chains, conveying machinery, materials flow equipment, crushers, mining equipment, road machinery and malleable castings are typical of wide range of products.

68. Pneumatic Vibrators

Cleveland Vibrator Co.—12-page illustrated catalog No. 105 gives details of 29 types and 14 sizes of air operated vibrators, valves and fittings which are applicable to wide range of shaking and settling uses. Dimensions, operating principle, available mountings and other information are included.

69. Roof Ventilator

American Machine & Metals, Inc., DeBothezat Fans Div.—2-page illustrated bulletin DR-27-50 is descriptive of motor-driven vertical discharge roof ventilators available with 36, 42 and 48-in. diameter fan wheels and capacities up to 40,900 cfm. Units are weatherproof at all times.

70. Traveling Cranes

Northern Engineering Works—8-page illustrated booklet G-700 shows wide range of installations of overhead electric cranes in all types of industrial plants. Cranes are used for handling machines, bulk and other materials, parts and equipment.

71. Bentonite

Wyotana Mining Co.—8-page illustrated folder "Terra-Gel" tells story of this Wyoming bentonite for rotary drilling. Organic or mineral in nature, material forms gel upon mixing with water. Properties of gelatinization, viscosity and thixotropy make material especially suited for use in rotary drilling muds.

72. Spray Nozzles

Spraying Systems Co.—Two illustrated catalogs No. 22 and No. 23, containing 32 and 12 pages respectively, present complete data on spraying systems nozzles and related products and on pneumatic atomizing nozzles. Available patterns, pressure and discharge ratings, and application data are given for entire line.

73. Magnetic Separator

Dings Magnetic Separator Co.—8-page illustrated catalog No. C-1100-A gives performance data and describes line of nonelectric Alnico Perma-Drum magnetic separators. These units are designed for tramp iron removal, concentration of magnetic substances, purification of products from contaminating iron and iron reclamation from foundry sand.

74. Riser Compound

Metal & Thermit Corp.—12-page illustrated booklet "Thermit Riser Compound" describes exothermic material which is designed to assure sound castings by promoting proper directional solidification. It also reduces special casting design by eliminating many chills and blind risers. Volume of riser metal is held to minimum.

75. Materials Handling

Maquoketa Co.—2-page illustrated bulletin depicts and describes gasoline powered fork truck and stacker and hydraulically operated and controlled loader for handling bulk materials and aggregates. Fork truck is capable of lifting 1000 lb, has short turning radius and can be obtained with lift height built to specification.

76. Band Saws

DoALL Co.—2-page illustrated data sheet No. 48-900 lists specifications and attachments for line of 16-inch Utility band saws which will cut wood, metal and plastic. Both step-pulley and infinitely variable speed types are available to meet practically any cutting requirement.

1	21	41	61	81	101
2	22	42	62	82	102
3	23	43	63	83	103
4	24	44	64	84	104
5	25	45	65	85	105
6	26	46	66	86	106
7	27	47	67	87	107
8	28	48	68	88	108
9	29	49	69	89	109
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13	33	53	73	93	113
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15	35	55	75	95	115
16	36	56	76	96	116
17	37	57	77	97	117
18	38	58	78	98	118
19	39	59	79	99	119
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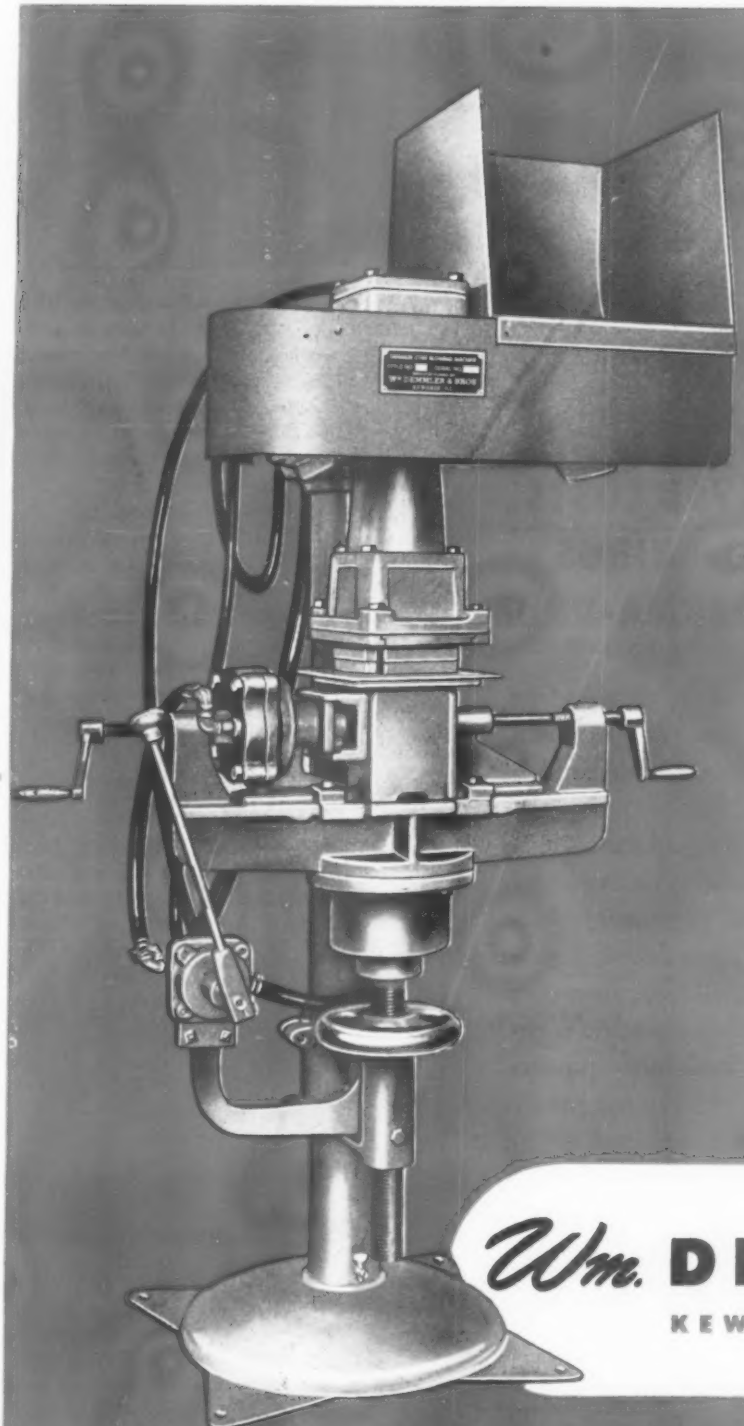

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Short run jobs can be profitable, too!

The DEMMLER No. 55 is proving it every day . . . day after day in foundries everywhere. This small, rugged, efficient core blower is ideal for blowing cores weighing up to four pounds; was especially designed to fill the foundryman's need for just such work.

Sand magazine and carriage are aluminum castings, mounted on ball bearing rollers for utmost ease in pushing from filling to blowing position.

The DEMMLER No. 55 has *both* vertical and horizontal air operated core box clamps, controlled automatically by the same hand valve that blows the core.

This versatile machine will accommodate boxes 9 inches long, has sliding, quick change blow plates and features a trouble-free diaphragm type blow valve.

Sand magazine opening is 4½ by 9½ inches. Three different sand magazine sizes available.

Simple in construction . . . simple in operation, the DEMMLER No. 55 core blower is the economical solution—the profitable solution—to the rapid production of high quality small cores. Very reasonable in cost, the DEMMLER No. 55 is an extremely worthwhile addition to any foundry, large or small.

Illustrated specification sheet will be sent on request.

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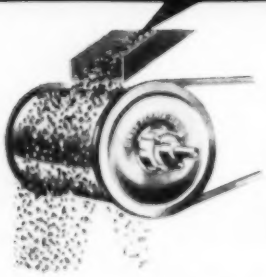

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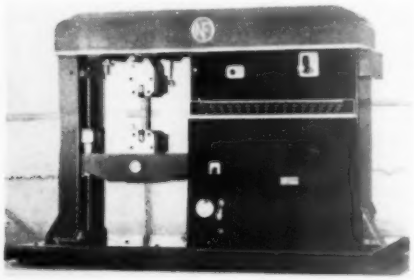
Dings MAGNETIC SEPARATION HIGH INTENSITY Reg. U.S. Pat. Off.

(*Continued from page* 214)

capacity of 40 cfm and causes a line pressure drop of only 1 psi. Unit weighs 1½ lb and measures 2⅜ x 3¾ x 5⅛ in. Inlet and outlet are threaded for ½-in. pipe.

For More Details Circle No. 12—Page 215

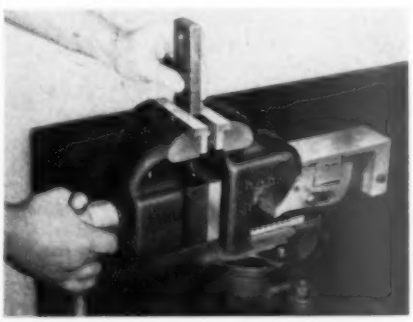
Testing Machine: Testing Machine Division, National Forge & Ordnance Co., Irvine, Warren County, Pa.—Table model machine for tension, compression, flexure, shear and transverse tests is available in two



capacities: 15,000 and 30,000 lb. The former has additional ranges of 300-lb and 3000-lb; the 30,000-lb model may be used for 600-lb or 6000-lb testing. Loading is mechanical with crosshead speeds infinitely variable from 0.005 to 6 in. per minute. The weighing system consists of knife-edge pivot levers connected to calibrated steel elastic beams. Working space between columns is 20 in. with a 14-in. crosshead stroke. Machine is furnished with gear-operated wedge grips. Fixtures for making compression, flexible and shear tests and holders for threaded specimens are available as extras.

For More Details Circle No. 13—Page 215

Vise: Dodge Mfg. Corp., 500 South Union St., Mishawaka, Ind.—New quick action, machinist's vise, built on a new principle and embodying a patented fast slide action is de-



signed to open or close to any position in one second through a push-pull action which eliminates spinning the handle. A turn and a half of the handle counter-clockwise, and the jaw slides in "neutral" to any position. From the moment the work is engaged the vise operates in the conventional manner. A specially

designed no-pinch handle protects operator against blood blisters between thumb and forefinger. Vise is provided with either a swivel or stationary base and is built in the 4-in. size only. It weighs 58 lb. A cut-away view of the vise is shown here which illustrates the operating mechanism employed.

For More Details Circle No. 14—Page 215

Floor Resurfacer: Monroe Co., Dept. 5-3, 10703 Quebec Ave., Cleveland 6—Material for resurfacing and repairing cement floors is said to bond well with concrete and to form a hard, long wearing surface unaffected by dampness or acids. Material is offered as a dry powder which is mixed with water for application. It is said not to shrink or break its bond. It sets up at room temperature in about 8 hr and is ready for heavy duty trucking in 24 hr.

For More Details Circle No. 15—Page 215

Sand Tester: Claud S. Gordon Co., 3000 South Wallace St., Chicago 16—Instrument for determining the

permeability of sand molds and cores is designed to be used in the foundry for routine production control and in the laboratory for the investigation of new materials and new procedures. Operation of the instrument is based on the principle of measuring the time required for a definite volume of air at constant pressure to pass through standard test specimens. There are no valves or orifices to complicate its operating. No computations are involved as the American Foundrymen's Society permeability values are indicated on the instrument dial.

For More Details Circle No. 16—Page 215

V-belts: Goodyear Tire & Rubber Co., Akron, O.—New line of V-belts incorporate a chemically-produced fibre of high strength, low stretch and good shock absorbing qualities. The strength of the new

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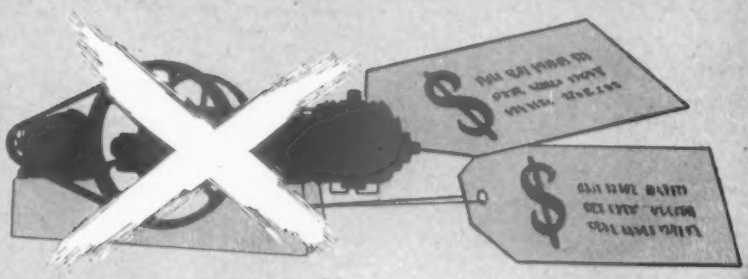

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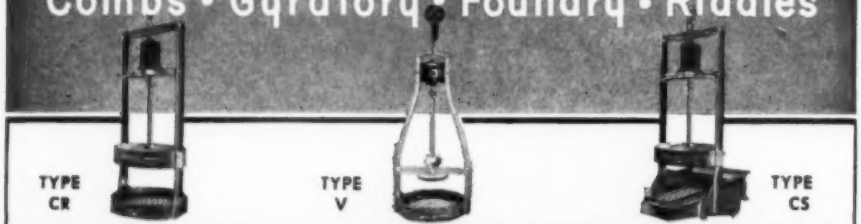

GREAT WESTERN MANUFACTURING CO.
LEAVENWORTH, KANSAS, U.S.A.

fibre is said to enable this belt to handle 40 per cent more horsepower than standard multi-v-belts without excessive stretch. Other features claimed are that the new synthetic is water and mildew resistant and has inherent resistance to shrinkage.

Fro More Details Circle No. 17—Page 215

Microscope: Buhl Optical Co., Dept. TF-3, 1009 Beech Ave., Pittsburgh 12—Wide field industrial 20-power microscope is designed to with-

stand the rough handling of shop use. Microscope may be angled in any direction and raised and lowered to accommodate pieces up to 12 in. high. Fine focus adjustment is obtained by helical focusing eyepiece. Microscope is corrected for spherical and chromatic aberrations, and is said to render a well-defined image over a wide, flat field. The objective is achromatic, mounted in its own cell fitted with standard threads so that it is interchangeable with any standard microscope objectives.

For More Details Circle No. 18—Page 215

Roller Conveyors: Sage Equipment Co., 30 Essex St., Buffalo 13—Roller conveyors employ ball bearing wheels as end bearings for the rollers. These wheels are pressed into each end of 2-in. diam rollers which ride on ¼-in. cold-rolled steel shafts. Side frames, of all welded steel construction, are made of ⅛ x 1 x 2-in. channel. Roller conveyors are available in 5 and 10-ft straight sections and 45 and 90 degree curves. Curves have inside radius of 34 in. Available widths are 12 and 18 in. with rollers on 3, 6, 9 or 12-in. centers.

For More Details Circle No. 19—Page 215

Tempered Dial Glass: Hydroway Scales Inc., 20624 West Eight Mile Rd., Detroit 19—New impact resistant, special tempered dial glass designed to eliminate need for protective metal guards is used on the company's hydraulic crane scales. The glass is said to be five times as strong as plate glass of equal thick-

ness yet will bend as much as 20 degrees without breaking. It will absorb a thermal shock of 500° F without breaking or distorting. Core of the new glass is relatively soft and exterior surfaces extremely hard. It can be polished and wiped indefinitely without scratching, it is claimed.

For More Details Circle No. 20—Page 215

Painting Bond: Kelite Products Inc., P. O. Box 2917, Terminal Annex, Los Angeles 54—A coating for the treatment of iron and steel preparatory to painting is said to form a dense, smooth film of low porosity and high plasticity which cannot absorb paint excessively. The coating can be controlled to provide a light or heavy paint bonding film. Salt spray tests show high resistance to rusting both on painted and unpainted work. The nontoxic and nonflammable material is applied by immersion or spray.

For More Details Circle No. 21—Page 215

Motor Shock Absorber: Crown Mfg. Co., 1025 North Sixth St., St. Louis 1—Motor shock absorber is designed to absorb the jerk occasioned in across the line motor starting. It is claimed that the unit causes no power loss and reduces the torque by permitting the motor to gain momentum before picking up the entire load. It will carry any load the motor will pull. Unit can be

furnished either for forward or reversing drives and for all motor sizes from ¼ to 3 hp.

For More Details Circle No. 22—Page 215

Water Pump: Clipper Mfg. Co., 2800 Warwick Trafficway, Kansas City 8, Mo. — Factory-sealed water pump on the company's Model HD masonry saw eliminates the necessity of disconnecting the pump when cutting dry. To switch from wet to dry cutting, the operator mere-

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ly turns the pet cock on the outlet of the pump. Failure to disconnect the V-belt, letting the water in the reservoir run low or clogging of the water suction line have no effect on this pump, which can be operated dry without burning out, it is claimed.

For More Details Circle No. 23—Page 215

Air Control: Logansport Machine Co., Logansport, Ind.—Air regulator-filter-lubricator measures 6 in. square by 4¾-in. deep. It incorporates a piston-type reducing valve, pressure gage, lubricator and syn-

thetic-type air filter element. It is installed in the air intake line from the main air line and can be mounted on a central control panel. Two knobs on front panel provide for accurate regulation of air pressure and amount of oil injected as required by the individual job. A third knob is for draining the water trap. Indicators provide ready visibility of both air pressure and oil level.

For More Details Circle No. 24—Page 215

Floodlight: Mattox Machine Co., 331 Commercial St., Los Angeles—Waterproof, all-weather, outdoor floodlight made of aluminum and weighing 1.6 lb, will operate when completely submerged in water, it is claimed. The light is efficient in the temperature range from −100 to +500° F. It uses 300, 500, 750 or 1000-w bulbs of standard thread size. Wired for quick installation, the lamp can be locked in any position. Attachable shade reflects in any direction, extends 4 in. beyond the globe and can be trimmed to any desired length.

For More Details Circle No. 25—Page 215

Welders: Hobart Brothers Co., Hobart Square, Troy, O.—New line of transformer type alternating current arc welders has no moving parts. An electrically adjustable reactor replaces the cranking method of setting welding current. Two models are offered, both with power factor correction; model TSP-205-C is rated 200 amp at 30 v, and model TSP-182-C with limited input for opera-

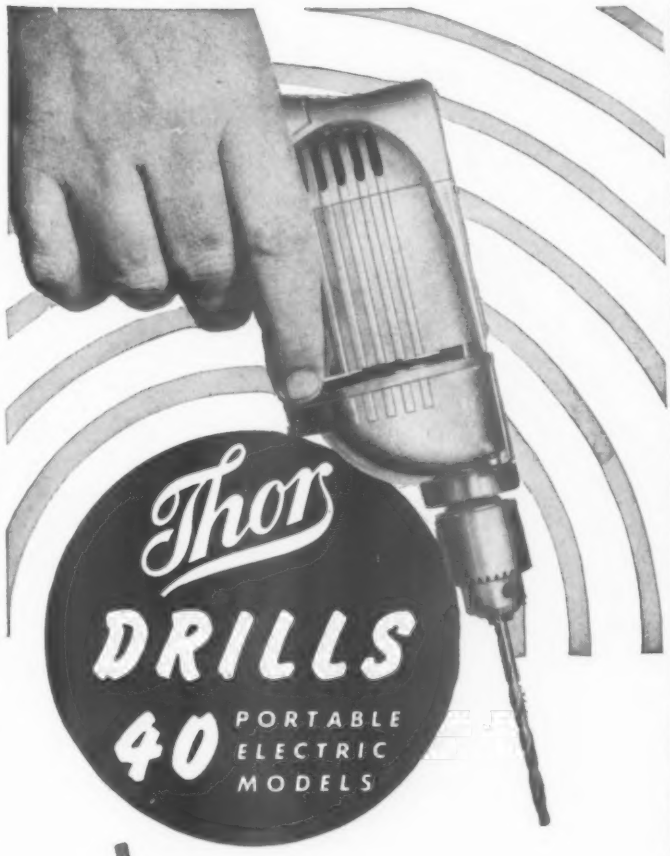
tion on REA lines is rated 180 amp at 25 v. Control of the five main taps of welding current from low to maximum is accomplished with a large hand wheel switch mounted on the front panel. A rheostat controls the amount of direct current flowing into the reactor to give 100 welding current settings in each of the five main ranges. Rheostat can be removed and used at a distance from the welder by inserting an ordinary extension cord with standard plug and receptacle. Model TSP-205-C is designed to operate on single phase 60 cycles either 220/440 dual voltage or 550 v. It also can be supplied for 50 cycles. Model TSP-182-C is designed to operate on single phase, 60 cycles, 230 v.

For More Details Circle No. 26—Page 215

Lubricant: Swan Finch Oil Corp., 30 Rockefeller Plaza, New York—High-temperature lubricating oil is available for bearings and chains continuously subjected to severe operating temperatures. Product of a new refinery process, the lubricant is said to have good resistance against gum, carbon or sludge formations. Field tests have shown its suitability for lubricating conveyor bearings, core oven bearings, and textile mill oven bearings and chains.

For More Details Circle No. 27—Page 215

Saw: DeWalt Inc., 1400 Fountain Ave., Lancaster, Pa.—New power saw is mounted on a pressed steel cabinet which can be equipped with shelves and drawers for storing tools. Weight of entire unit is 115 lb. Recessed cabinet top design permits easy removal of the saw unit, table and table base from the cabinet, allowing use of the machine as a portable power saw which can be transported to an on-the-job site. Saw is equipped with a ½-hp motor, and is



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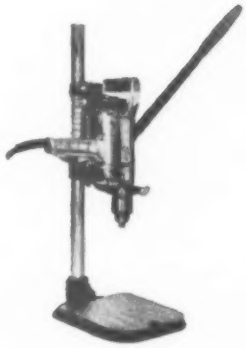

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designed to cut 2-in. thick material, cross-cut 12-in. wide and rip to the center of a 43-in. panel. It is said to perform straight and bevel ripping, ploughing, grooving, tenoning, sanding, dadoing light metal cutting, mitering, cross-cutting, and other operations.

For More Details Circle No. 28—Page 215

Die Casting: Hydraulic Press Mfg. Co., Mount Gilead, O.—Self-contained, all hydraulic die casting machine is designed for producing castings in magnesium, aluminum, or copper-base alloys. High injection pressure is sustained through the

cold chamber injection system and is confined within the die cavities. Injection plunger is returned hydraulically, and injection speed is governed by controlling oil discharge rate ahead of the injection piston. Hydraulic die clamp consists of a main ram and a fast closing booster ram which closes the clamp platen to within a fraction of an inch of the total clamp stroke. Die openings are controlled through electric timers. Automatic control of die movement, clamping, injection plunger movement is provided. A hydraulically actuated cylinder provides for the automatic ejection of the casting. Die clamping pressure is 400 tons. Production maximum is 125 shots per hour.

For More Details Circle No. 29—Page 215

Current Collector Wheels: United States Graphite Co., 1621 Holland St., Saginaw, Mich.—Carbon-graphite current collector wheels for use on electric cranes is said to be a self-lubricated material that makes bushings unnecessary and eliminates trolley wires greasing. Dead spots do not develop on the wheel because pitting, arcing and burning are minimized, it is claimed. Additional claims are that the carbon-graphite material is unaffected by operating heat or fumes and is unchanged by cold, rain, sleet or snow.

For More Details Circle No. 30—Page 215

Battery Chargers: General Electric Co., Schenectady 5, N. Y.—Single circuits rotating type automatic battery charging equipment is available in two models for lead-acid and nickel-iron-alkaline batteries. Au-

tomatic features of the new equipment include battery cut-off and charger shut-down when battery is fully charged. There also is automatic disconnection of charger from power line and opening of charging circuit in case of power interruption. Charger is restarted automatically upon resumption of power service. Control of the charging rate under the modified constant voltage charging system also is automatic. One of the new models covers lead-acid batteries of 12 to 20 cells up to 530 amp-hr capacity and 21 to 24 cells up to 450 amp-hr, and nickel-iron-alkaline batteries of 20 to 24 cells up to 500 amp-hr capacity and 25 to 30 cells up to 460 amp-hr. The other model covers lead-acid batteries of 12 to 20 cells up to 750 amp-hr capacity and 21 to 24 cells up to 630 amp-hr, and nickel-iron-alkaline batteries of 20 to 24 cells up to 700 amp-hr capacity and 25 to 32 cells up to 600 amp-hr. Both models operate on 220/440-v, 3-phase, 60-cycle power supply.

For More Details Circle No. 31—Page 215

Dump Box: Palmer-Shile Co., 16033 Fullerton, Detroit 27—Automatic end dump box is designed for use with lift trucks or fork trucks and can be constructed with casters for easy moving around machinery

and through narrow aisles. Box is mounted on a rocker geared to a track for smooth dumping. A safety latch keeps box from tilting during loading and transportation. Unit is constructed of welded steel plate reinforced with heavy angles.

For More Details Circle No. 32—Page 215

Muller: Buckeye Products Co., 7020 Vine St., Cincinnati—Portable muller weighs 85 lb and handles mixes up to 7 lb. It is designed to handle small batches or for experimental laboratory purposes. Machine is made with only two moving assemblies, and is cleaned and reassembled easily, it is claimed.

For More Details Circle No. 33—Page 215

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Steel Foundry Core and Molding Sands

(*Continued from page* 103)

that it will not stand up when a large volume of liquid steel flows over it for a considerable time. It has also been incorrectly stated that cement-bonded sands are highly resistant to the temperature of liquid steel, because the fusion point of cement is around 2800° F. It is true that the cement has this comparatively high fusion point, but the mold is composed not of cement, but of silica sand and cement, which is a very different matter.

At the temperature of liquid steel, the silica of the sand readily unites with the CaO, MgO and Al_2O_3 of the cement to form a component of very low melting and softening point. The iron oxide on the surface of the liquid steel further reduces the softening point of the heated mold. The attack of the liquid steel on the cement-bonded sand is very severe, and in actual practice sand adherence near the gates of large steel castings is so bad that the process could not be used unless means were taken to prevent it.

Substitute for Sand

Some ten years ago the author introduced the use of fine alumina (aluminum oxide), as a substitute for silica sand in the area at and near the gates of cement-bonded sand molds in steel foundry work. A patent[24] covering the method was issued, and assigned to one of the steel foundry companies using cement-bonded sand. The alumina used is the grade known as settling tank fines, and is the dust produced in crushing lumps of electrically fused bauxite for the manufacture of grinding wheels. The dust is collected and settled in water, and though much of it is too fine to use, a large amount of satisfactory material was available at the time the process was developed. On a screen test, 95 per cent of this alumina passes through the 200 mesh screen.

Mixed with high-early-strength cement in the proportion of 100 lb alumina, 13 lb cement and water to make the moisture content of the mixture 9 per cent, this material is rammed against the pattern at the points where the sand tends to burn onto the casting. For light sections, a thickness of an inch of the alumina-cement mixture is enough to secure satisfactory results, while for very heavy castings as much as 4 in. may be required. The alumina mixture should be more thoroughly

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compacted, and rams to a much greater hardness, than cement-bonded silica sand does. Both molds and large internal cores are thus so thoroughly armored against attack by the steel that burning on or penetration is almost completely prevented.

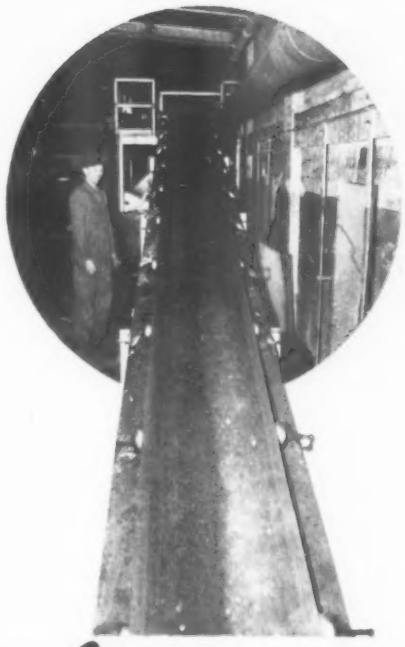
It might be supposed that a wash composed largely of alumina could be used at the places subject to burning on, and thus secure the desired results much cheaper than by using the material as a facing. It has been found, however, that if only a thin washed coating is used, burning on is made much worse instead of better. Apparently when cement, silica sand and alumina are in such close contact they are quickly raised to a high temperature, and unite to form a compound of low fusion point which favors the penetration of the steel between the sand grains instead of preventing it.

Use Silica Flour Wash

When a wash is to be used, it should consist chiefly of silica flour. It does not tend to flux the sand and form low melting point compounds because its composition is the same as that of the sand on which it is spread. It has also been found that it is not merely the fineness of the alumina that prevents burning on and penetration, since all attempts to secure the same results with silica flour instead of alumina have been failures.

Permeability of the alumina-cement mixture is very low, seldom exceeding 2 or 3. It is essential therefore, that this material should not be used except at places where the steam generated in it by the heat of the steel can escape through the more permeable sand-cement mixture that forms the body of the mold or core. This almost complete lack of permeability makes alumina-cement mixture unsuitable for small internal cores, which would have to be made largely of the alumina mixture, with too little sand-cement in the center to vent off the steam.

By using a somewhat specialized technique, large patterns can be used for molding in cement-bonded sand. Generally they are set on a swept-up bed, or are bedded in. When using the latter method, it is essential that there be no deep draws involved, since the pattern will not be lifted until much of the sand has set, and it does not come away freely from the sides of the mold, unless there is a very heavy draft on the pattern. Instead of bringing the drag as far up the side of a deep pattern as would be the case in dry sand mold-



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ing, this portion of the mold is made of a series of blocks or cores, which taken together form what amounts to a cheek.

The molders knock together forms made of rough lumber, inclosing a space bounded on one or two sides by part of the pattern, and on the other sides by the temporary form. In this space the sand is rammed in as it would be in a corebox, with rods about every 6 in. of depth to give the block rigidity. Upon completing a block, the rough form is knocked off, newspaper is spread over the face or faces of the block that meet the next portion to be rammed, another section of form is set up, and the sand rammed between the first block, the pattern and the form. It is best to make the parting between the two blocks or cores lie at a considerable angle to the vertical, so that they will separate readily. Before the second block is rammed, the first one must have set or hardened enough to make it reasonably firm, so that it will not be knocked out of shape by the rammer.

Sections Are Marked

When the several blocks forming the cheek of the mold have been completed, cover cores are rammed over them and over the top of the pattern. Partings between them are set at such angles that they will lift away from each other easily. Before each block is lifted, scratch marks are made across both horizontal and vertical joints, so that in re-assembling the mold, the several blocks of which it is composed will be correctly located. The sand must be allowed to harden undisturbed for about a day before it is strong enough to bear handling. An example of a mold made in this manner is shown in Fig. 19 (THE FOUNDRY, December, 1948, page 93). In this illustration a large cement-sand core is being lowered into position in a mold made up of a number of blocks of the same material, which were rammed up in the manner just described. To give the core assembly the strength required to resist the pressure of the liquid steel, flask sections have been set around the blocks and sand rammed between them and the blocks.

Other examples of cement-sand molding and core making were given in the sections on patterns and molding methods published in previous issues of THE FOUNDRY. Fig. 6 on page 82 of the November, 1948 issue and Figs. 53 and 54 on page 92 of the March, 1949 issue, show the ramming up of a core in a box with skeleton top for sweeping. In the

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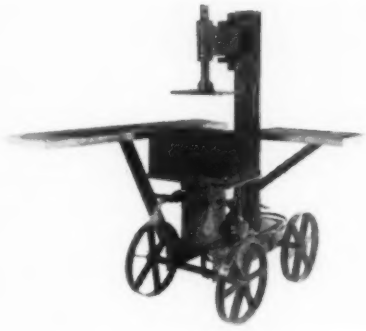

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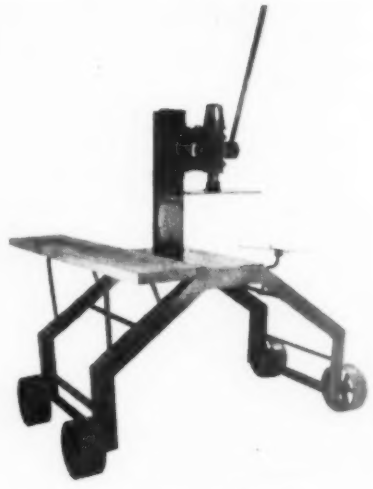

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November, 1948 issue, on page 83, Fig. 12 shows a bedded-in drag mold made in a flask, with the pattern drawn. On page 76 of the January, 1949 issue, Figs. 29 and 30 show a mold for a propeller, made with a pattern which forms one blade, and part of the hub. Both the drag sections and the cope blocks were rammed with temporary forms, and the scratch marks for locating one cope block are easily seen in the illustration. On the same page, Fig. 31 shows a partially assembled mold for a rudder casting, and Fig. 32 the casting made in it. In this job, only the swept-up drag was made in a flask, most of the mold being formed of blocks rammed separately.

On page 77 of January, 1949, Fig. 33 shows a large cement-sand core being lowered into the mold, and Fig. 34 the hydraulic cylinder casting made in this mold. The central core was armored with alumina at the areas near the gates. Fig. 38 on page 79 of that issue shows the core-box used to form a propeller in an assembly of separate cores, set on a swept bed, instead of the method illustrated in Figs. 29 and 30. On pages 93, 94, 95 and 96 of the March, 1949 issue, Figs. 58, 59, 60 and 61 show a swept mold, and the cinder pot made in it, and Figs. 61 to 67 illustrate the steps in making a mold for a centrifugal pump runner.

Method Subject to Delay

The operation of making a mold in sections, using a conventional pattern as described, is sometimes subject to delays due to the necessity of waiting for one block to partially set before the next one can be started. Whenever possible, therefore, it is quicker to use a set of coreboxes to make up the entire mold, instead of a pattern. In many cases, however, much more lumber would be required to make the coreboxes.

Patterns and coreboxes for cement-sand molding must be kept in better repair than those used in dry or green sand practice, since cement-sand will not come away freely from rough, battered-up pattern surfaces. Old beat-up pattern equipment that can still be employed at a pinch to turn out a few green or dry sand molds, is hard to use in cement-sand practice.

In cement-sand practice, trouble is also encountered when patterns or coreboxes are painted with ordinary pattern paints, and especially when shellac has been used. The setting of the cement evolves considerable heat, which softens the shellac or paint and makes the sand stick to the wood so tightly that it is almost

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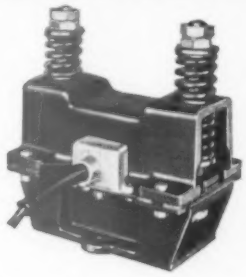

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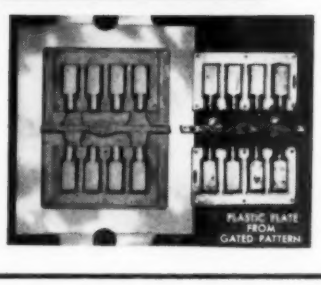
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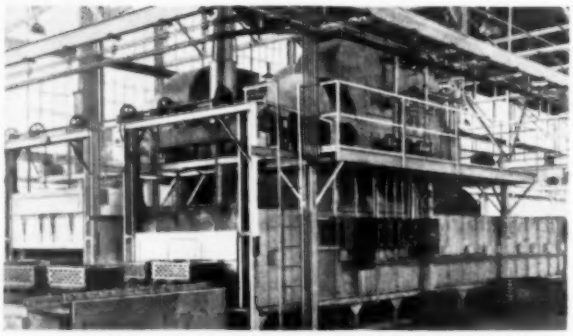

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impossible to draw the pattern. Even when satisfactory pattern lacquers are put on over shellac, the sand may stick badly.

In some cases it is possible to prevent this trouble by laying sheets of tin against the wood, as is done with old worn-out patterns, but it is better to paint the coreboxes or patterns with proper lacquers in the first place. Duco is fairly satisfactory, but special materials made by Arco Co., Monsanto Chemical Co., American Lacquer Solvents Co., and probably others, will be found to stand up better when the patterns or coreboxes are to be used many times. Even with the best paints and lacquers, it is often necessary to spray the patterns or boxes with liquid parting to secure a good draw.

While silica sand bonded with cement will part cleanly from new sheet tin, alumina and cement will stick to it badly. It has been found, however, that if the tin is allowed to rust a little before it is used, a clean parting will be obtained with ce ment-bonded alumina. Several special varnishes, too, can be applied to the tin which will effectively prevent cement-bonded alumina from sticking to it.

Cement Sand for Corebox

In making a large cylindrical core in a solid lower half corebox, with a skeleton top and strikes, a considerable saving in the cost of the coreboxes can be secured by making the lower half box of cement sand, instead of wood. The half box is built up on the foundry floor out of lumps of old cement sand molds and backing sand, and is brought to the proper outline by means of a sweep mounted on bearings at each end, just as in sweeping up a half mold for a large steel roll. The skeleton to shape the other half of the core is mounted on the cement sand box just as it would be were the box made of lumber, the lower half box is lined with sheet tin, and the core rammed up the same as in regular practice. On completing the order, the cement sandbox is knocked down, and only the board sweep need be stored.

As may readily be imagined, similar methods may be employed to advantage in other cases. For instance, when a number of castings are to be made from a single pattern by bedding it in green sand in the foundry floor, a semipermanent form rammed up in cement bonded sand, against which the green sand is rammed, will make it possible to save a great deal of time, labor and sand. The form is left in the floor

and used over and over, and only the comparatively thin layer of green sand it contains is shaken out with the casting. The cement-sand form is thus a cheap substitute for a "tailored" flask made to fit the job.

Reference

24. U.S. Patent No. 2,144,532 "Manufacture of Foundry Molds," granted Jan. 17, 1939 to John Howe Hall and assigned to Birdsboro Steel Foundry & Machine Co.

Issues Gray Iron Safety Booklet

Gray Iron Founders' Society, 210 National City-East Sixth Bldg., Cleveland 14, has published a booklet entitled "How You Can Work Safely," intended for distribution to employees in any gray iron foundry. Printed in two colors and well illustrated, the booklet was prepared by a committee of gray iron safety experts, headed by George A. Riley, supervisor of safety, American Brake Shoe Co., New York. All general and departmental safety hazards known to exist in gray iron foundries are covered and means are provided to insure that each employee has read the booklet and received special instructions from his foreman regarding specific safety hazards applicable to his particular job. Space is allowed for imprinting the foundry name on front cover for a moderate charge over regular price of 20 cents per copy for the booklet.

Book Review

1949 *Book of ASTM Standards, including Tentatives, Part I on Ferrous Metals*, 1372 pages, 6 x 9 in., published by the American Society for Testing Materials, Philadelphia. Price $10.

This triennial publication brings up to date the various specifications and tentative specifications covering the field of ferrous metals. It is Part I of six volumes covering the entire field of specifications of ASTM. The text includes specifications for steel castings, cast iron and malleable iron, as well as ferroalloys.

In the field of steel castings, seven specifications and eight tentative specifications are included, in addition to two tentative specifications covering methods and one tentative specification on definitions. The cast iron section includes six specifications, four tentative specifications, three methods of tests, two recommended practices and two definitions. Malleable iron includes two specifications and two tentative specifications.

Any foundry selling castings according to ASTM specifications will find this book of standards exceedingly valuable for reference purposes.

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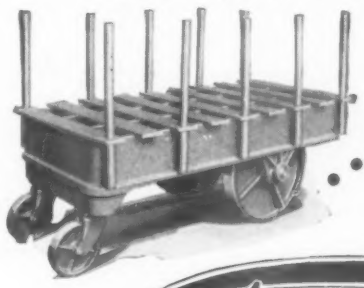

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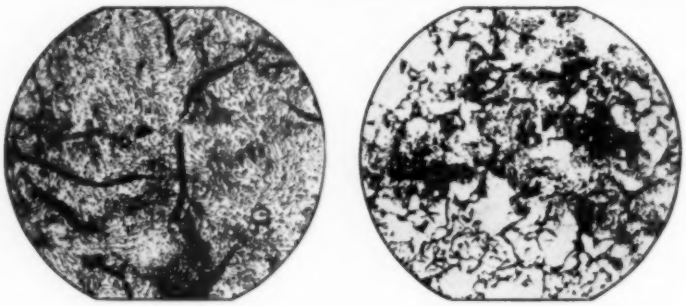

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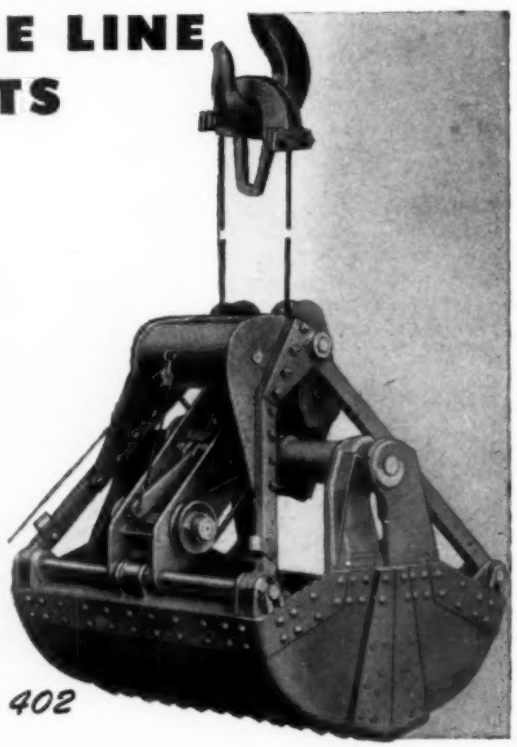

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Permanent Mold Casting Of Gray Iron

(*Continued from page* 113)

a substantially uniform temperature of 2700-2750 F on the metal delivered to the bull ladle. Some silicon is also added in the electric furnace. Temperature of metal from the cupola varies from 2500 to 2800 F.

The electric furnace can be filled at whatever rate is desired and can fill the 2000-lb bull ladle rapidly when it is returned on the trolley that travels the loop along which the casting machines are located. Thus, the electric furnace simplifies the problem of metal handling besides helping to control the temperature of metal delivered and its silicon content.

As the temperature of metal delivered to ladles at the casting machines is closely controlled and the casting rate at each machine is constant, casting conditions remain nearly uniform and this promotes a high yield.

The pouring station for each casting machine (Fig. 5) is adjacent to the aisle separating two rows of machines and almost below the overhead trolley loop for the bull ladle that brings metal to the tiltable pouring ladles at each machine. These pouring ladles are supported from long vertical hooked rods so that the pourman can swing the ladles enough to follow easily the slow rotation of each mold while pouring continues.

One Ladle Follows Another

At each pour station, two pourmen work alternately. While one pours, the other helps to skim the ladle in use and, before the ladle is emptied, signals for a new charge which is delivered to a second pouring ladle hanging from another rod. When one ladle is emptied, another filled one is put into use by the other pourman.

In this way, pouring is substantially continuous and always keeps pace with the machine being served. Pourmen stand on fixed platforms somewhat above the floor and at the most convenient height to fill the molds. Air is delivered by forced draft to pouring areas to keep these areas comfortable and free of fumes.

After the molds are poured, they continue through a cooling station until the castings are solidified and ready to be ejected, though still at red heat. Air for cooling the molds is drawn through them by a blower driven by a 50-hp motor for each machine.

This air flows continuously through each box as the molds move around with the table but the heat carried

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Each of these testing units was designed to conform with the recommendations of the Committee on Foundry Sand Research of the American Foundrymen's Society.

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off is greatest between the filling and ejection stations when hot metal is in the molds. The weight of air moved greatly exceeds that of the metal cast.

Just as each mold reaches the ejection station, a cam trips an air valve and the air plunger opens the mold (Fig. 6). This motion actuates ejectors but does not always free the castings and gates, hence a man at the ejector station uses a bar as may be required to force the cast metal free. If castings stick so that the mold is not cleared within the normal time interval, the knockout man presses a button that stops the machine until the mold is cleared. At this station air jets blow out any sand remaining in prints and clean the mold before it enters the smoke box to start on its next cycle.

At each machine, four men generally are required. One sets cores, two pour and one helps knock castings out of molds.

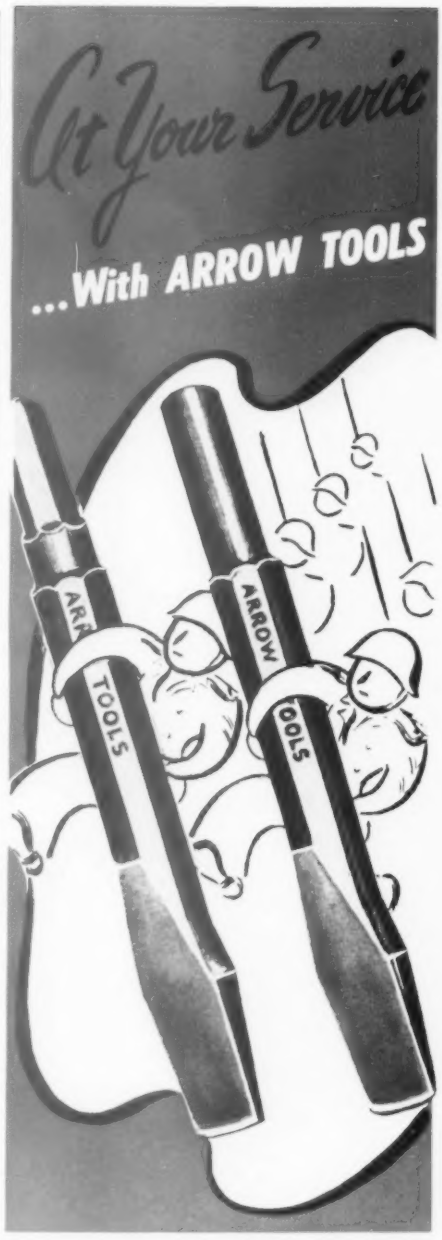
Castings Are Annealed

Castings knocked from molds fall into a pit and onto a conveyor. Both castings and gates, still at red heat, are advanced by conveyors from all the machines and are dumped continuously into a huge inclined and slowly rotated annealing drum (Fig. 7), similar to those used in cement kilns. As the castings are still hot, the heat required to hold them at 1600 F for the 45 minutes needed to advance the castings through this drum is less than if castings were cooler when entering the drum. Some core sand is removed by an exhaust at the annealing drum.

The purpose of this annealing is to remove the chill from the surfaces of the castings by converting the white iron into gray iron. Castings issue from the drum continuously onto a transverse conveyor that moves them slowly through a duct in which slow air cooling takes place. Air circulated through this duct removes heat, dust and fumes. Before castings issue into an inclined cooling drum, water is sprayed on them. In the cooling drum, remaining core sand, including the bulk of that used, is removed. From the drum, castings are deposited onto a picking conveyor (Fig. 8), free of sand. Sand falling from castings in the drum is discharged near its center and falls into a disposal bin.

Operators at wheels along each side of the picking conveyor (Fig. 8), cut castings from gates. Castings are delivered to a storage conveyor (Fig. 9). The storage conveyor carries castings up inclines for discharge into one of four airless blast machines that are charged in rotation.

From the cleaning units, castings



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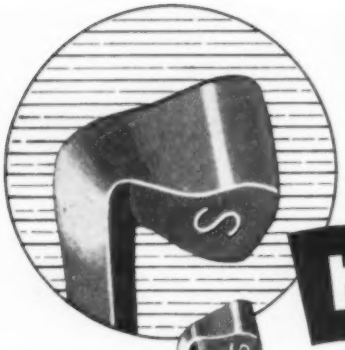

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are discharged onto an inspection conveyor (Fig. 10) from which, as castings pass inspection, they are thrown into tote boxes of which there is one for each type of casting then in process. As tote boxes are filled they are ready for transfer by fork truck to machining setups.

Sand cores employed in making the permanent mold castings are blown. After a first bake in a gas-fired oven, the cores are dipped and then are re-baked and cooled before delivery to casting machines.

The process is rapid and highly mechanized. To date, however, it has been confined to the making of small and fairly simple castings needed in quantities large enough to warrant building metal molds and employing casting machines on a suitable scale. Thus, the process is much less flexible than sand casting but it is well adapted to the type of castings needed in the production requirements of the Delco-Remy plant.

Book Review

Kent's Mechanical Engineers Handbook, twelfth edition, in two volumes; Vol. I edited by Colin Carmichael, editor, *Machine Design*, 1611 pages 5⅝ x 8⅛ in. cloth; Vol. II, edited by Kenneth Salisbury, general engineering and consulting laboratory, General Electric Co., 1409 pages, 5⅝ x 8⅛ in. cloth; published by John Wiley & Sons Inc., New York. Price $8.50 per volume.

This old and authoritative work has been completely revised and rewritten by 172 authorities in the field. The data presented consists primarily of: Basic principles; working formulas; charts and tables; standard dimensions, proportions and specifications; and illustrations of typical equipment. One section is devoted to *Design and Production* and the other to *Power*.

Foundrymen will be particularly interested in the volume dealing with *Design and Production*, since references to metals and castings appear frequently. Section 19 devotes 45 pages to discussion of *Metal Molding and Casting Processes*, with the text prepared by these men: Iron and Steel Casting, by Charles K. Donoho, American Cast Iron Pipe Co.; Malleable Iron Castings, by James H. Lansing, Malleable Founders' Society; Copper Base Alloy Casting, by H. M. St. John, Crane Co.; Aluminum Alloy Casting, by W. P. Goepfert, Aluminum Co. of America; Magnesium Alloy Casting, by William H. Gross, Dow Chemical Co.; Zinc Alloy Casting, by G. L. Werley, New Jersey Zinc Co.; Precision Investment Casting, by F. S. Badger and W. O. Sweeny, Haynes Stellite Co.

Further foundry interest will be

found in the section dealing with general properties of metals, iron and steel, corrosion and corrosion resistance, nonferrous metals and alloys, strength of materials, vibration and noise control, bearings and lubrication, mechanical power transmission, electric motors and their control, machine components and testing, joining of metals, metal cutting processes, dimensional control, working of nonmetallic materials, materials handling, and production plant construction and equipment.

The editors offer congratulations to Colin Carmichael, editor of *Machine Design*, another Penton Publication, and to J. Kenneth Salisbury of General Electric Co., for a job well done.

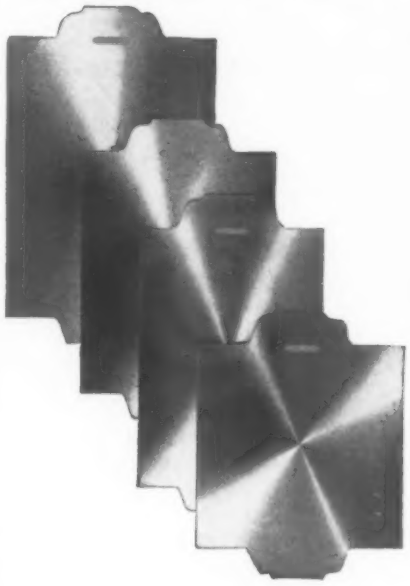
Materials Handling Handbook

Electric Industrial Truck Association has published a 72-page book entitled "Handbook of Material Handling with Industrial Trucks," offered as a practical guide for analysis of material handling operations and application of the unit-load method with power-operated industrial trucks and accessories. Sections of the book are devoted to evaluation of industrial truck handling; material handling management; organization of an industrial truck system; and practical truck engineering. Different types of skids, pallets and other load carriers are illustrated and described and pictures are shown of actual applications of industrial trucks in handling and storage operations. Available from Electric Industrial Truck Association, Department PR, 3701 North Broad St., Philadelphia 40, copies of the book may be secured for $1 each.

Offers Course In Quality Control

State University of Iowa, Iowa City, Iowa, is offering its eighth 10-day course in Quality Control by Statistical Methods Oct. 31 to Nov. 10. The course is designed for supervisory personnel and for those who can apply immediately the knowledge gained.

The fee, including books and supplies, is $100. Trainees must provide for their own living expenses and transportation to and from Iowa City. Application for registration may be addressed to Prof. Lloyd A. Knowler, department of mathematics, at the university.



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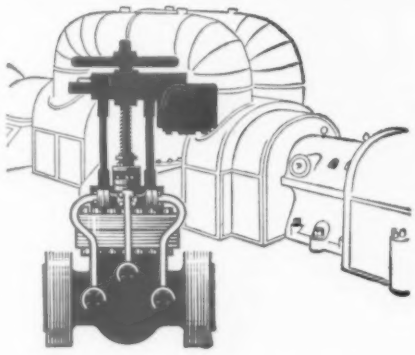

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With the EDITORS

WAR Comes Home: Vacationing in lovely Vermont, visiting many of the points of historical interest in that section of New England, or writing this on the shore of beautiful Lake Champlain, one almost forgets—at least for a moment—the nearness of war. But the tragedy of the conflict in Korea has been brought home forcibly to all of the folks on the staff of this publication. Assistant editor Virginia C. Taylor received word from her son, Lt. David F. Taylor, on Aug. 18, that he had been wounded in Korea ten days before. Lt. Taylor has been flown back to this country and now is at the Great Lakes Naval Hospital where he is being treated in preparation for an operation. Thinking of the rough time that Dave Taylor and thousands of others have had in Korea, and the long casualty lists which are appearing in every part of the country, we are appalled at the terrible price our sons are paying for indifference, inefficiency, inaptitude, ignorance and the placing of politics above the welfare of the nation by many of our leaders in Washington.

—o—

Management Interest: Opening of the first stage of the International Harvester Co.'s research foundry in Chicago in mid-August, as reported on page 114, gave the representatives of the business press and newspaper field in attendance an interesting sidelight into the importance the management of that organization places on the various Harvester foundries. The affair was attended by much of the top brass of Harvester. Chairman Fowler McCormick told how the project is designed to help the company produce better castings at a lower cost under better working conditions, and President John L. McCaffrey decked himself out in all of the required safety equipment to pour the first casting. We only wish that managements of all captive foundries had the same sympathetic understanding of the processes and the product.

The illustration below shows about half of the group attending the opening. Chairman McCormick is talking to the visitors, President McCaffrey is at the extreme left and J. W. Armour, manager, International Harvester's Manufacturing Research Department, is directly across the table.

—o—

Deflater: Every time we get to feeling a bit satisfied with the importance of the material presented each month to our 45,000 readers, someone comes along and punctures the balloon. For example, in reply to a question regarding types of trades and technical publications read, one Eastern gray iron foundryman, who employs five molders, replied: "We contact with other foundries on up-to-date changes and keep many theories away from our practical sense. We receive no publications, only samples."

Would you call this a form of inbreeding?

—o—

Prefer Foundries: The *Boston Sunday Herald* on Sept. 3 carried a story headed "Farmers Mad as DP's Quit for Higher Pay of Industry." Examples were cited, and what industry do you think half of these DP's preferred to farming? You guessed it—the foundry industry. Can you imagine such a state of affairs? F.G.S.

Luncheon at opening of Harvester's research foundry

Offers History of Apprenticeship

How apprentice training has developed in this country since Colonial days is reviewed in a 26-page booklet prepared by Bureau of Apprenticeship, U. S. Department of Labor, Washington 25. Entitled "Apprenticeship Past and Present," the booklet reveals not only the antiquated training methods used by the early settlers, but those in vogue during subsequent periods. Described and illustrated are numerous examples of the early apprentice indentures, which are compared with present-day apprenticeship agreements, the modern verison of the original indentures. Copies may be obtained from Superintendent of Documents, U. S. Government Printing Office, Washington 25, at 15 cents per copy.

Exhibit Explains Trade Group Work

Gray Iron Founders' Society, Cleveland, has developed an exhibit to explain to the "man in the street" what a trade association is and what it does. Although specimens of society publications and materials are used to illustrate various services and functions performed by a typical trade organization, the main purpose of the display is to show some of the general types of work in which nearly all national trade groups are engaged.

The display is scheduled for presentation at various locations in Cleveland and Boston, and at Northwestern University, Evanston, Ill.

Book Review

Symposium on Effects of Low Temperatures on the Properties of Materials, 62 pages, 6 x 9 in., published by the American Society for Testing Materials, Philadelphia 3. Price $1.50.

This symposium, originally presented at the Philadelphia district meeting of the society in 1946 and reviewed by the authors in 1949, has just became available in printed form. It contains four papers: "Low Temperature Behavior of Organic Plastics" by H. K. Nason, T. S. Carswell and C. H. Adams; "Low Temperature Properties of Elastomers" by John W. Liska; "Effects of Subatmospheric Temperatures on the Properties of Nonferrous Metals by Norman L. Mochel, and "The Properties of Weldments at Low Temperatures" by Robert D. Stout.

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For More Details on these Items Use Reply Card—Page 215

GRINDING WHEELS: Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37—Catalog ESA-191 describes grinding wheels for plain cylindrical grinding, and includes grain and grade recommendations of wheels for that class of work. Popular wheel sizes and data on speeds and feeds are listed.
For More Details Circle No. 90—Page 215

TIERING TRUCKS: Lyon-Raymond Corp., 6571 Madison St., Greene, N. Y.—Bulletin 701, dealing with riding type electric tiering trucks, explains a skid tiering model, a pallet tiering model for single-faced pallets and one for double-faced pallets. Specifications of all models are listed and discussed.
For More Details Circle No. 91—Page 215

SPEED REDUCER: Falk Corp., 3001 West Canal St., Milwaukee 8—Bulletin 1105, dealing with concentric shaft speed reducers, covers method of selection, minimum sprocket diameters, maximum overhung loads, weights, oil capacities, and dimensions. Tables list torque capacity and horsepower ratings.
For More Details Circle No. 92—Page 215

POWER SHOVEL: Stearns Magnetic Mfg. Co., 662 South 28th St., Milwaukee 46—Illustrated bulletin 250A describes a power shovel which is driven through a magnetically-actuated friction clutch and has a contact switch in the shovel handle, permitting instantaneous control of power by the operator.
For More Details Circle No. 93—Page 215

CRANES: Northern Engineering Works, 2615 Atwater St., Detroit 7—Bulletin HL-115 describes design and construction of new line of auxiliary overhead electric traveling cranes. Brief specifications are supplemented with illustrations of subassemblies, close-up views, and typical installations.
For More Details Circle No. 94—Page 215

TEST CABINETS: Industrial Filter & Pump Mfg. Co., 5900 Ogden Ave., Chicago 50—Revised catalog page deals with test cabinets used for accelerated testing of the corrosion-resisting qualities of coatings on metal products. It describes applications, design features and principal specifications of the different size models.
For More Details Circle No. 95—Page 215

COMPRESSED AIR POWER: Committee on Engineering Education, Compressed Air and Gas institute, 1410 Terminal Tower, Cleveland, 13—Booklet contains basic reference data on compressed air and gas power. It is a nontechnical review of the application of compressed air and gas theory to actual machines and uses.
For More Details Circle No. 96—Page 215

DISPLAY POSTERS: Elliott Service Co., Dept. Q-C 44, 30 North Mac Questen Parkway, Mount Vernon, N. Y.—Folder shows sample display posters which carry the theme of improved quality and reduced costs. Also offered is a booklet for foremen and supervisors, entitled "How to Maintain Quality."
For More Details Circle No. 97—Page 215

PHOTOGRAPHY: Eastman Kodak Co., Industrial Photographic Division, 343 State St., Rochester 4, N. Y.—Booklet summarizes applications of photography in business and industry. Illustrations show its use for research, production, quality control, training, advertising, and sales.
For More Details Circle No. 98—Page 215

CABLE HOISTS: Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland—Folder describes company's line of heavy-duty electric cable hoists. It is illustrated with photographs, diagrams and line drawings, and gives descriptions, specifications, prices and ordering data.
For More Details Circle No. 99—Page 215

NICKEL ALLOYS: International Nickel Co., 67 Wall St., New York 5—Technical bulletin T-6 reports on the resistance of nickel and its alloys to corrosion by caustic alkalies. Pure nickel, nickel alloy irons and higher nonferrous nickel alloys are discussed.
For More Details Circle No. 100—Page 215

AIR PUMPS: Leiman Bros. Inc., 297-F Christie St., Newark 5, N. J.—Catalog 450, which describes how air pumps operate and where they are used effectively, contains performance curves and specification tables on the company's two and four-wing type air pumps and accessories.
For More Details Circle No. 101—Page 215

VARIABLE SPEED DRIVE: Link-Belt Co., 307 North Michigan Ave., Chicago 1—Booklet 2349 covers electronic, pneumatic, hydraulic, and mechanical automatic controls for the company's positive, infinitely variable speed drives.
For More Details Circle No. 102—Page 215

HEATING OPERATIONS: Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.—Catalog 1043B illustrates and describes oil and gas burning equipment for cupola lighting, mold drying, ladle heating and drying, core baking, and furnace heating.
For More Details Circle No. 103—Page 215

AIR VIBRATORS: Cleveland Vibrator Co., 2788 Clinton Ave., Cleveland 13—Catalog 105 illustrates and presents data and specifications on

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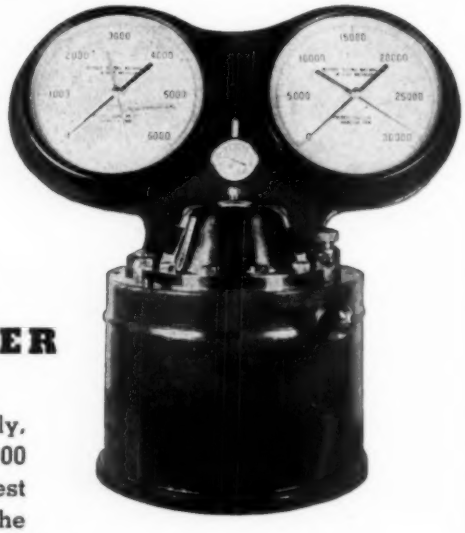

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For More Details Circle No. 104—Page 215

AIR FILTER: American Air Filter Co., 125 Central Ave., Louisville 8—Bulletin 211 describes a replaceable air filter made of glass filaments. It is made in standard sizes for forced air heating, ventilating and air-conditioning systems.
For More Details Circle No. 105—Page 215

JOB STUDY: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Certified job study 95 discusses savings through efficient materials handling at Pittsburgh Equitable Meter Division, Rockwell Mfg. Co., Pittsburgh.
For More Details Circle No. 106—Page 215

PNEUMATIC CONVEYOR: Convair Corp., 1501 Potomac Ave., Pittsburgh 16—Bulletin 103 describes a pneumatic conveying system for handling bulk materials. Materials are carried through a piping system in a flow of air or inert gas at 1 to 10 psi.
For More Details Circle No. 107—Page 215

FIRE BRICK: Walsh Refractories Corp., Dept. W, 101 Ferry St., St. Louis 7—Bulletin features intermediate duty and high heat duty fire brick. Properties are detailed and general characteristics and uses are specified.
For More Details Circle No. 108—Page 215

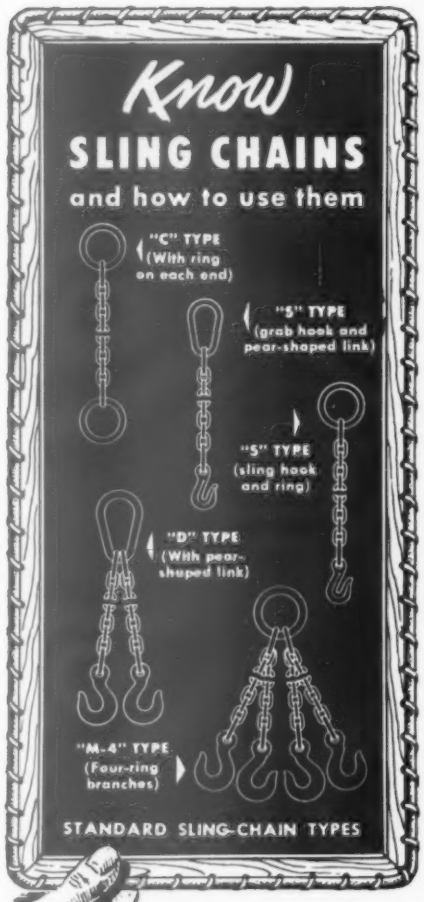
RESEARCH ADMINISTRATION: Arthur D. Little Inc., 30 Memorial Dr., Cambridge 42, Mass.—Bibliography entitled "Management of Industrial Research" contains a list of books and articles on research policies and procedures.
For More Details Circle No. 109—Page 215

MATERIAL HANDLING: Clark Equipment Co., Industrial Truck Division, 258 Champion St., Battle Creek, Mich. — *Material Handling News*, Vol. 8, No. 1, illustrates applications of the company's fork trucks and attachments.
For More Details Circle No. 110—Page 215

CAR UNLOADER: Fairfield Engineering Co., Marion, O.—Illustrated bulletin 950 describes company's belt car unloader powered by electric motor or gasoline engine and gives specifications.
For More Details Circle No. 111—Page 215

COLLOIDAL GRAPHITE: Acheson Colloids Corp., Port Huron Mich.—Bulletin 426 describes colloidal graphite dispersions as lubricants in a number of metalworking operations including die casting.
For More Details Circle No. 112—Page 215

DUST COLLECTORS: Bubar Dust Systems Inc., Old Lyme, Conn.—Folder describes the operation and features of the company's dust collectors and lists a number of companies for whom recent installations were constructed and erected.
For More Details Circle No. 113—Page 215



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Last Longer

You get long life from American Shot and Grit. America's one manufacturing process assures uniform hardness and size of every pellet. American cleans faster than ordinary abrasive. For low-cost, quality cleaning in your plant . . . order American today in the 100-pound bags, all sizes graded to S.A.E. specifications.

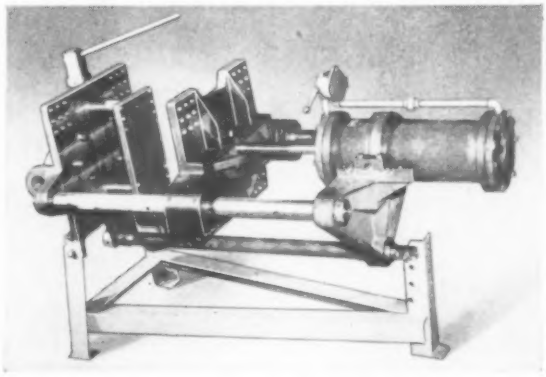
Magnified 40 times, this photograph shows the uniform quality of American Shot and Grit . . . your best buy for economical blast cleaning.

AMERICAN SHOT & GRIT **THE AMERICAN STEEL ABRASIVES CO.**

GALION, OHIO

PERMANENT MOLD MACHINE

SAVE ON TIME & MOLD COSTS
USE INSERT TYPE MOLDS



FEATURES

- ADJUSTABLE FOR VARIOUS THICKNESS MOLDS
- USE EJECTOR PLATE VERTICAL OR HORIZ.
- TILTING STAND
- HARDENED RACKS & PINION
- GROUND GUIDE BARS
- ADJUSTABLE BAR CENTERS
- AUTOMATIC TIMER (OPTIONAL)
- MEEHANITE FRAMES
- BUILT IN TWO SIZES

SEND CASTINGS OR BLUE PRINTS FOR QUOTATIONS

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Quantity
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of
GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

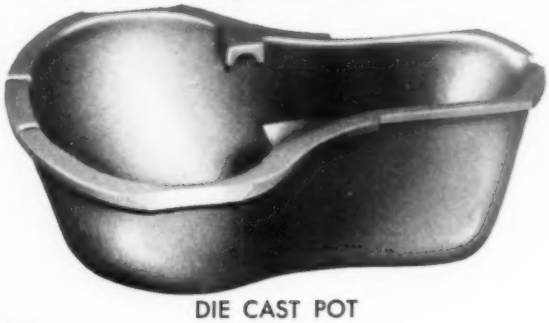
MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

MELTING POTS—Ingot Molds

FOR NONFERROUS METALS FROM ACME SPECIAL FORMULA

SPOUT POT
NO. 550A



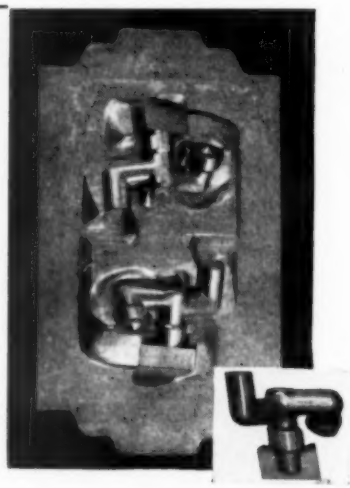
DIE CAST POT

HOLDING BOWL
NO. HP7001

WRITE FOR
SCHEDULE OF 40 SIZES

ACME FOUNDRY COMPANY
2502 22nd Street **DETROIT 16, MICH.** *Phone:* Tashmoo 5-2404

Where Production is the first Consideration, Pressure Cast Aluminum Matchplates and Cope and Drag Plates are the only Satisfactory Answer



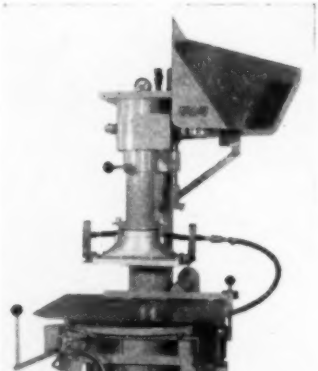
Only one master pattern does it! From it we make you single or multiple pattern matchplates, casting them under pressure in plaster molds. Why not find out exactly how much we can save you by this method, or by furnishing cope and drag plates which likewise jump production and lower your costs?

Get our quotations today.

PLASTER PROCESS CASTINGS COMPANY
6922 Carnegie Avenue Cleveland 3, Ohio
(Toledo Matchplate Co., Toledo 2, Ohio, Affiliated)

Pressure-Cast MATCHPLATES
COPE and DRAG PLATES

◂COR-BLO▸ AUTOMATIC



HIGH DRAW
MODEL "C-H-E"
Cores up to 8 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

Let us figure on your requirements.

HARRISON MACHINE COMPANY
Wesleyville, Erie, Pa.

Users will tell you—

This Radiator Chaplet reduces casting rejects.

PATENTED OPEN HEAD

An exclusive and patented design, permitting sounder packing of sand under the head and around stem of chaplet. Cores are held firmly, resulting in better castings.

CLEVELAND CHAPLET & MFG. CO.
1197 W. 67th St., Cleveland, Ohio

We also make MOTOR CHAPLETS

BOILER CHAPLETS,
FORGED HEAD CHAPLETS,
FITTED HEAD CHAPLETS,
DOUBLE HEAD CHAPLETS
and other types.

CLEVELAND *Chaplets*
Since 1890

MIX CORE SANDS MOLDING SANDS CUPOLA PATCH MIXES IN **4 MINUTES** FLAT

THEN *DISCHARGE 'EM* IN THIRTY SECONDS

***Lower Costs?* YOU BET!**

It's the new PERFECT MIX MULTIMIXER that kneads, as it turns, as it rubs to give you the most modern equipment of its kind on the market today for better cores—better castings. Sizes from 3 to 60 cu. ft. Hundreds of units in operation. Direct motor drive—no clutch—no belts. A real time saver—cost cutter.

Sold only through nationally known foundry and equipment dealers. Consult your supply dealer or write direct.

MULTIPLEX MACHINERY CORP. ELMORE OHIO

Have YOU a problem with SLUDGE in your fuel oil system?

READ THIS!

"By the use of Houghto-Solv in our Bunker C Fuel Oil we have eliminated the former need for daily shut-downs to remove carbonized burner cups and clean strainer baskets.

"We have been able to cut back the fuel flow control valves from 1.3 to .7 turns with the same steam load.

"Since using Houghto-Solv as an additive, soot has been reduced to the point where we have had one boiler operating for over four months. Only a short stop of the burner is necessary once a week to check the burner cup, which can now be cleaned by merely wiping off.

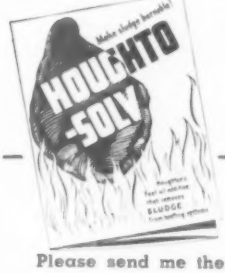
"Before adding Houghto-Solv it was necessary to shut down a boiler every 30 days to clean and wirebrush the fire sides and tubes. We formerly had hard scale inside the tubes, which we were never able to remove completely. Any deposits now found will disintegrate in granular form and are readily blown out by the soot blowers.

"We have found that sludge in storage tanks, which formerly built up to 6" deep, has been completely dissolved. This alone has meant a big saving in labor; it has made the dirty and disagreeable job of hand cleaning, which was never complete nor satisfactory, now unnecessary.

"Altogether, I have found that HOUGHTO-SOLV will do all that has been claimed for it, with more than satisfactory results."

Many similar letters, all reporting immediate efficiency and economy, tell us that Houghto-Solv really does its job! This fast acting fuel oil additive cleans the entire fuel system. It dissolves sludge, making it burnable with the oil. Expensive and messy cleaning jobs are eliminated . . . one application, for example, saved a user nearly $2,000 on tank cleaning.

Results like those in the above letter can be yours, too . . . just add one quart of Houghto-Solv for every 1,000 gallons of oil in your tank. Your sludge problem will be cleared up fast.



Here's all the data—free

This helpful folder completely describes Houghto-Solv. Use the coupon below to get your copy — no obligation, of course.

E. F. HOUGHTON & CO.
303 W. Lehigh Ave., Phila., Pa.

Please send me the free HOUGHTO-SOLV folder.

Name ..... *Title* .....

Company .....

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COBALT 60

This fast, highly practicable and economical source of gamma radiation is now freely available. Orders for any amount can be filled promptly for

INDUSTRIAL RADIOGRAPHY of HEAVY METAL CASTINGS, WELDMENTS, PIPES - ETC.

Less costly than radium, Eldorado High Specific Activity Cobalt 60 is ideal for use where short exposure time and small focal spot are desirable.

For further information and manual on Cobalt 60 and Radium in industrial radiography, write to Dept. Y,

ELDORADO RADIUM

ELDORADO MINING & REFINING (1944) LTD.

P. O. BOX 379 OTTAWA, CANADA

"Lancaster" Mixers for Foundry Sands

Put More Valuable Minutes . . . In Every Man Hour

The exact and controlled conditioning of sand formulas by "Lancaster's" balanced mixing-mulling action puts more valuable minutes into every man-hour of the foundry production schedule. Core-sand mixes are developed to desired strength and permeability in any formula range. Binder or oil content can be reduced. And—"Lancasters" are "power-misers"—produce at maximum capacities with low power costs. Write today for catalog information . . . no obligation.

POSEY IRON WORKS, INC.
Brick Machinery Division
LANCASTER, PENNA., U. S. A.

HAUCK OIL AND GAS BURNING EQUIPMENT

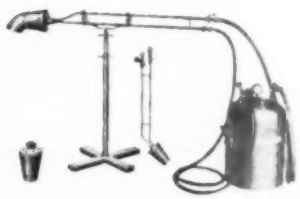
for
CUPOLA LIGHTING
MOLD DRYING
LADLE HEATING
CORE BAKING
FURNACE HEATING

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

Featuring
3 BIG OPERATIONS WITH 1 EQUIPMENT



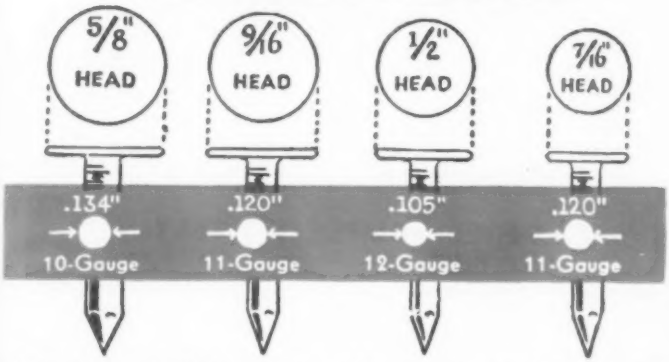
This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

HAUCK MANUFACTURING CO.
106 Tenth St., Brooklyn 15, N. Y.

Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

ANGELL . . . PROVEN PRESSURE PROOF CHAPLETS

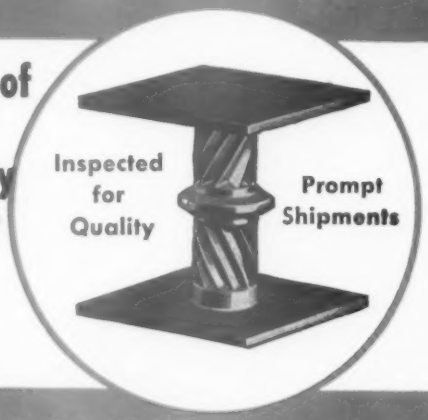
Producers of SUPER HEAD FOUNDRY NAILS



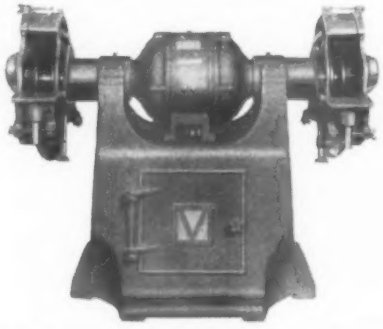
⅝", 9/16" & ½" Heads available up to 3 inches in length

Standard Foundry Nails available in all lengths.

All styles of Chaplets Accurately Made for Better Castings



THE ANGELL NAIL & Chaplet Company
4580 East 71st Street
CLEVELAND 5, OHIO



LOOKING FOR A PLACE TO *SAVE?*

You Can Cut Your *Wheel* Costs With A MARSCHKE GRINDER!

Every grinder in the Marschke line is built with two objectives in mind: (1) to give you a machine which will get the most work and the longest wear out of your grinding *wheels;* and (2) give you a machine with long, reliable and trouble-free service. The first is achieved through *elimination of vibration:* the second, through *quality materials* and engineering know-how.

The name "Marschke" means more than just quality, it means a complete *line* of grinding tools, adaptable to the solution of any grinding problem. Give us information on what you're up against, maybe we can suggest a solution.

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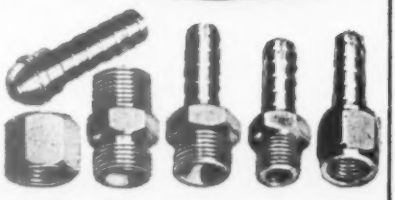
Air-O-chek The Valve with the internal fulcrum lever

An invention in valve means

Ingenious lever arrangement makes conventional packing stem and gland unnessary.

Used in leading foundries and machine shops.

See your jobber or write direct for full details



AIR-WAY PUMP & EQUIP. CO., 1058 N. Kilbourn Ave., Chicago 51 Ill.

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ROURA

Self-Dumping

HOPPERS

Only ROURA Has the Exclusive Instant Release (Patent Pending) Handle

Handling wet or dry, hot or cold, bulky materials quickly and easily, the ROURA is simple to operate—only one man is required for distributing and unloading—and he does this in *much* less time than ordinarily required under old-fashioned manual methods. Thousands of Roura Hoppers (which fit any standard fork or platform lift truck) are in constant daily operation, serving and saving for such firms as Ford, Champion Porcelain, General Electric, National Carbon, International Harvester, etc.

By a simple lift of the *exclusive* release handle, the ROURA HOPPER dumps, rights, and locks itself securely. Sizes—½, ¾, 1, 1½ and 2 cubic yards; the ROURA HOPPER can also be designed for flat trucks and in other sizes to meet specifications. Also, it can be equipped with special flanges that permit stacking to desired tiers for storage or future distribution of materials—conserving valuable floor space. Priced below all competition, the ROURA will quickly pay for itself many times over.

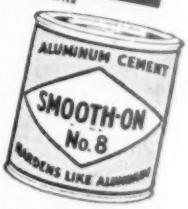
Write today for detailed brochure, "In Dollars & Sense."

ROURA IRON WORKS, Inc.
1407 Woodland Ave. Detroit 11, Mich.

For Surface Blemishes in ALUMINUM CASTINGS

Have you used the Smooth-On Foundry Cement made especially to correct blow holes, porous and rough spots, dents and other unsightly but harmless surface defects in otherwise sound *aluminum* alloy castings?

Applied like the widely used Smooth-On *Iron* Foundry Cement, Smooth-On No. 8 *Aluminum* Cement fills in evenly, hardens quickly, matches perfectly. Stays in place, too, for it expands slightly as it sets.



Smooth-On No. 8 Aluminum Cement comes in 1-and 5-lb. sizes. 1 lb. will fill 17 cu. in. Order it by NAME AND NUMBER from your supply house. If they haven't it, write us. If you have not yet discovered Smooth-On No. 8, ask us for

FREE SAMPLE TO TEST

You'll receive also the famous 40-page SMOOTH-ON HANDBOOK, filled with industrial uses for the various Smooth-On Cements. 170 illustrations. Write today.

SMOOTH-ON MFG. CO., Dept. 17
570 Communipaw Ave., Jersey City 4, N. J.

Do it with SMOOTH-ON
No. 8 ALUMINUM CEMENT

Fastest possible dressing action on snagging wheels and other large or coarse wheels calls for Desmond Huntington dressers. Five types of handles and three sizes of cutters meet the full range of requirements. Write The Desmond-Stephan Manufacturing Co., Urbana, Ohio, for the complete Desmond Catalog No. 45F.

Desmond

DRESSERS & CUTTERS

They Strip Clean EVERY TIME!

...Use NON-BURN NON-WARP

SLIP JACKETS

CMD Slip Jackets up to 8" deep have *single* reinforcement angle irons (as shown above). Deeper jackets have *double* reinforcement angle irons (as shown at right).

These rugged, top quality slip jackets offer unmatched performance and durability. They prevent costly production delays and minimize finishing work because there is *no sticking, no ruined work*—they strip clean from the mold every time! and CMD Slip Jackets positively *will not burn!* Made of Monasbestos (½-inch thick) they outlast ordinary slip jackets many times. Sturdy corner irons and cross reinforcing irons eliminate warping. The corner irons are bolted to the jacket and the cross reinforcing irons are then arc-welded into place. This assures maximum strength. Order today, specifying degree of taper, size of flask at parting line and dimensions for jacket to fit below and above parting line.

Write Today for Descriptive Circular 10-F!

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SPECIAL
FOUNDRY COKE

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A QUALITY PRODUCT

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Measure Foundry Temperatures Accurately . . . at a glance!

Use the Simplified PYRO Optical Pyrometer

Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*

For Non-Ferrous Foundries . . . the PYRO IMMERSION PYROMETER

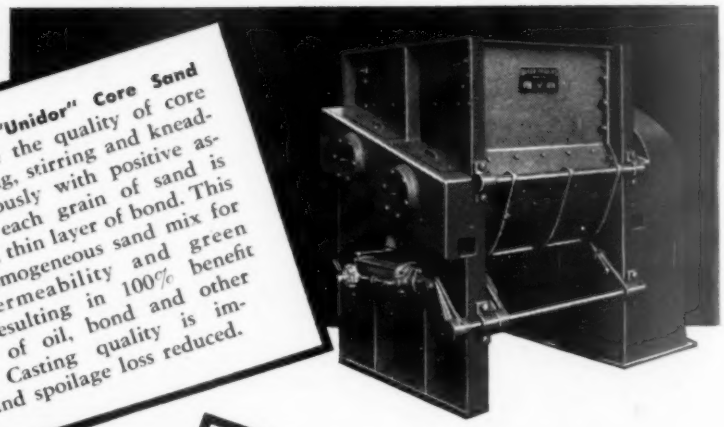
Helps insure low-cost production of SOUND, UNIFORM Castings. Has shielded steel housing which is shock-proof, dust-proof and moisture-proof—withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples are instantly interchangeable, without adjustment or recalibration. Large 4-inch easy-reading dial. Equipped with exclusive LOCK SWIVEL. Ranges: 1-1500° and 0-2500° F. *Write for FREE Catalog #150*

THE PYROMETER INSTRUMENT CO.
New Plant & Lab.
Bergenfield 6, New Jersey.

Better castings from improved sands...

BAKER PERKINS

"Unidor" core sand mixers and continuous mullers for molding sand



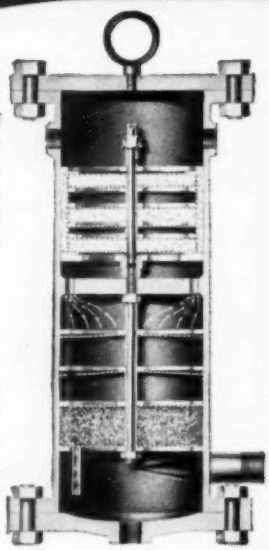
Baker Perkins "Unidor" Core Sand Mixers improve the quality of core sand by rubbing, stirring and kneading simultaneously with positive assurance that each grain of sand is coated with a thin layer of bond. This insures a homogeneous sand mix for desired permeability and green strength resulting in 100% benefit from use of oil, bond and other binders. Casting quality is improved and spoilage loss reduced.

Baker Perkins Continuous Mullers are ideal for mixing and tempering molding sands on a large scale. Unique blade arrangement thoroughly mulls and aerates the tumbling sand mass, and each grain is correctly coated with bond. With a minimum of attention, the B-P Muller will deliver an uninterrupted flow of 30 to 120 tons of molding sand per hour with the proper size unit recommended for the job.

BAKER PERKINS INC.

FOUNDRY EQUIPMENT SALES, SAGINAW, MICHIGAN

BOTHERED WITH BLOBS?



Are you bothered with blobs of oil or water ejected from your compressed air lines into expensive tools or onto vulnerable surfaces? Does your compressed air carry rust, scale, and dirt to score and clog equipment?

OIL IS POISON

When introduced via compressed air into such operations as lacquer spraying, mirror silvering, whiskey blending, or beer agitating, oil is "poison."

"AOF"

The Murphy "AOF" separates compressed air from all foreign matter, filters the air, and delivers it clean and dry to use. **Nothing but air will pass through a Murphy "AOF"! We guarantee it!**

EXPLANATORY LITERATURE FREE ON REQUEST. ASK FOR IT!

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

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Moisture Elimination Up To 3000 Pounds Per Square Inch

available now!

High Performance BERYLCO

BERYLLIUM COPPER

Metallurgically Controlled at Mill.

5 lb. Pigs

CASTING INGOTS

Berylco 20C } *High Hardness After*
Berylco 275 } *Heat Treatment*

Berylco 10C } *High Electrical Conductivity*
Berylco 50C } *After Heat Treatment*

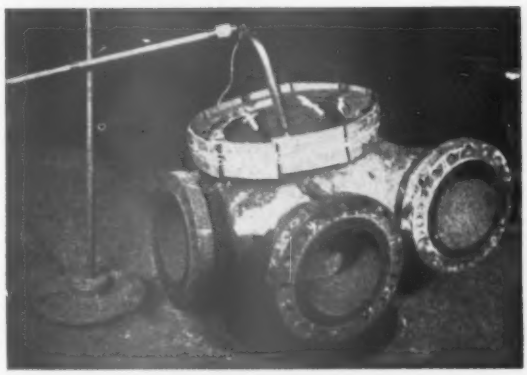
Much helpful information is available on specific properties, applications and casting methods by writing direct to

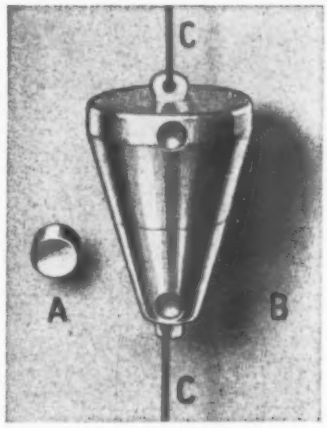
BERYLCO BERYLLIUM

The BERYLLIUM CORPORATION
READING 8, PENNSYLVANIA

BUY, RENT OR LEASE OUR RADIUM RADIOGRAPHY KIT

and make a short cut to more productive and economical foundry practice





The apparatus is as simple as
A—small radium capsule
B—cartridge container
C—rigid string support

The use of gamma rays in radiographing steel castings has increased by leaps and bounds since 1930, when the first commercial use of radiography was marked by a picture of the sternpost of the crusier "Chester". Radium radiography is simple, economical and effective; because it may be rented or leased, the equipment doesn't require a capital investment. Because it is simple to operate, it doesn't require especially skilled operators. By 1948 200 steel foundries were renting or leasing radium from the Radium Chemical Co., Inc., and today radium radiography is rapidly approaching the status of standard equipment in progressive steel foundries. Photograph shows a simple method for radiographing a flange on a heavy steel casting. Let us tell you more about the simplicity and economy of radium radiography; write today for prices, terms and case histories.

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570 LEXINGTON AVE., N. Y. (22) N. Y. CHICAGO: MASHALL FIELD ANNEX BLDG.
3723 WILSHIRE BLVD., LOS ANGELES 5, CAL.

LONG LASTING COAT FOR PATTERNS

Investigate the savings made possible by CO-LOIDAL-AC. Permanent protection against warping and swelling. Resists abrasion and mechanical damage. Never settles. Available in clear and colors, in gallons or drums.

Order today. Savings realized will soon repay your investment.

AMERICAN LACQUER SOLVENTS CO.
Phoenixville, Pa.

STOCK COREMAKING MACHINES

Rapid Model 3/8" to 3"

RAPID and WADSWORTH MODELS

MAKE STOCK CORES 3/8" to 7" IN ROUND, SQUARE AND IRREGULAR SHAPES . . . .

Wadsworth Equipment Co.
560 La Follette St.
Akron 11, Ohio

10 GRADES OF WASHED, DRIED, SCREENED

SILICA FOUNDRY SANDS

Produced from celebrated Ottawa District St. Peter Sandstone • Rounded Grains

Steel Molding Sand • Core Sand • Blast Sand • Furnace Bottom Sand
Opener Sand • Sand for Non-Ferrous, Aluminum, Magnesium Castings
MICROSIL Ground Silica (5 Standard Grades of Silica Flour)

MICROSIL GROUND SILICA

STANDARD SILICA CORPORATION

209 South LaSalle Street, Chicago • and • Ottawa, Illinois

DISTRIBUTORS IN ALL PRINCIPAL CITIES

BLACKHAWK SILICA SAND

AT LAST
Coke handled with minimum degradation and sand without leakage with

the New BLAW-KNOX "SHARK TOOTH" BUCKET

THE new Blaw-Knox Single-Line Hook-On Type Bucket equipped with "Shark Teeth" rehandles coke with minimum degradation. By simply applying the liner plates inside the "shark teeth" the *same* bucket handles granular fines (sand, coal or small limestone) without leakage. Available for different headroom conditions. Write for Form 2265.

BLAW-KNOX DIVISION
of Blaw-Knox Company
2097 Farmers Bank Building, Pittsburgh 22, Pa.

BLAW-KNOX FOUNDRY BUCKETS

CAST WITH PERMANENT MOLDS
Any Shape Casting

Model F

LOW COST WITH UNSKILLED LABOR

HIGH PRODUCTION WITH LOW RATE OF REJECTIONS

IRON CASTINGS WITHOUT CHILL

WIDE VARIETY OF METAL ANALYSES

☆ LOW COST GREEN SAND OR DRY SAND CORES

IDEALLY SUITED FOR SOIL PIPE FITTINGS

Write today for new illustrated bulletin No. 149

CENTRIFUGAL CASTING MACHINE CO.
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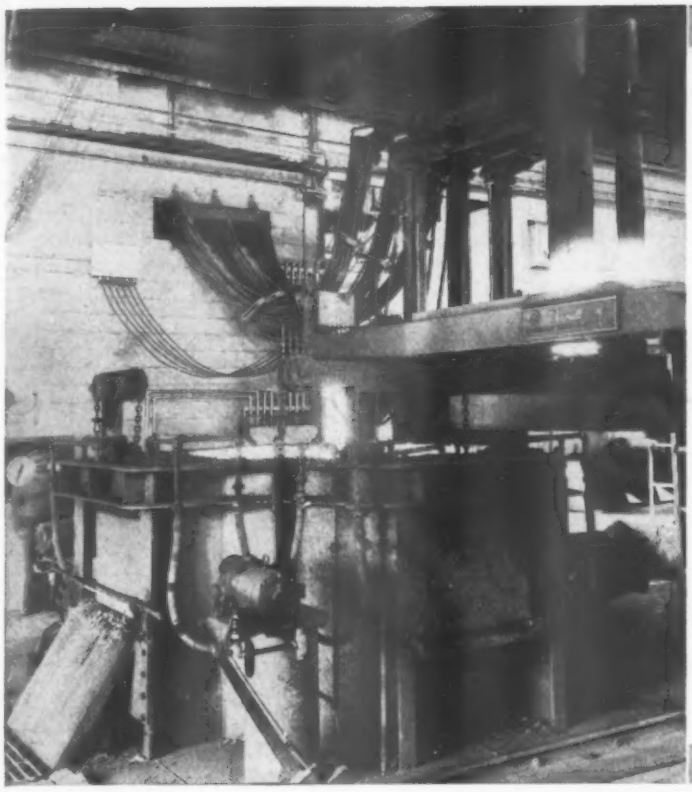

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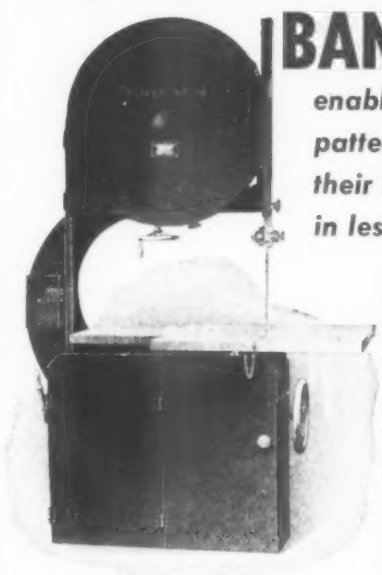

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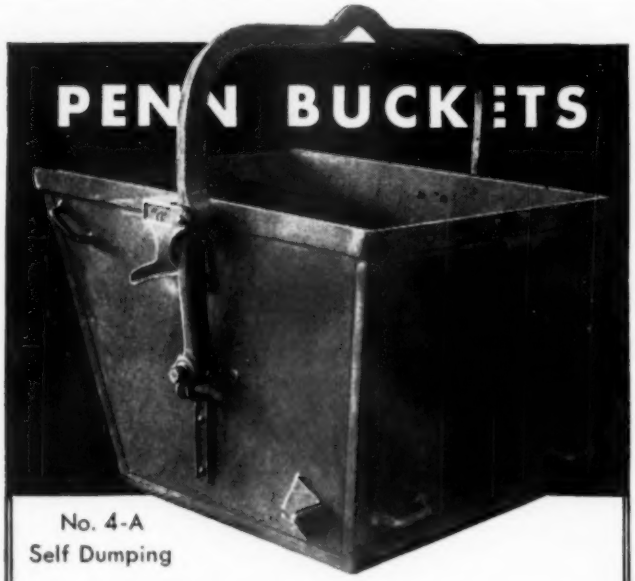

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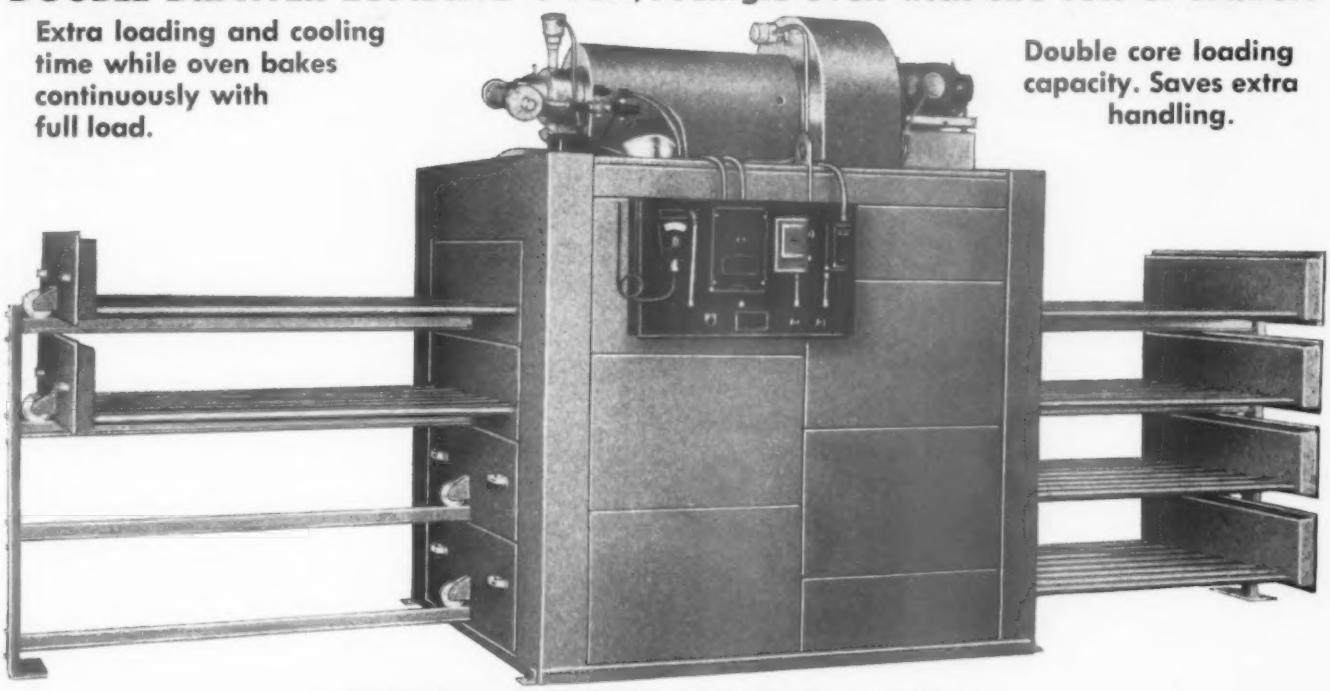

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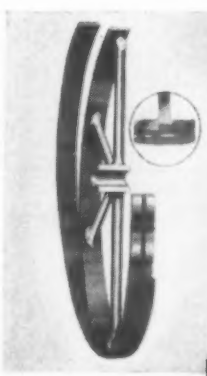

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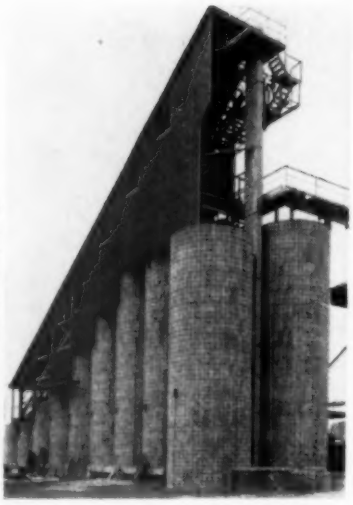

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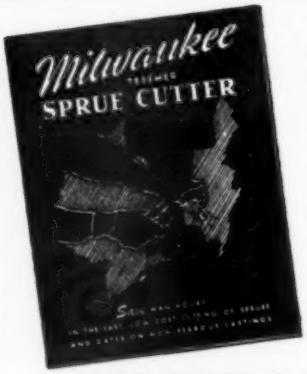

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BOX 181

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BOX 182

THE FOUNDRY CLEVELAND 13, OHIO

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For electric steel foundry, about 350 tons per month production. Must be able to rig patterns, and obtain maximum production from sandslinger, jolts and squeezer machines. Please give personal history, experience, availability and salary expected in your first letter. All correspondence will be kept confidential and personal interview will be arranged for qualified applicants. Address: Box 206, The FOUNDRY, Cleveland 13, Ohio.

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FOUNDRIES FOR SALE

GRAY IRON FOUNDRY. Equipped for production of light castings. Capacity 25 tons daily. Mostly new equipment. Operating. Priced to sell.

GRAY IRON FOUNDRY. Fully mechanized for mass production. Experienced organization.

EDWARD H. ZOLL
INDUSTRIAL PROPERTIES THROUGHOUT THE EAST
790 BROAD ST., NEWARK, N. J.

FOR SALE

Gray iron foundry—semi production and production castings, squeezer and light floor work. Leased buildings in surplus emergency labor area near St. Louis, Missouri. Ten to fifteen molders, fifteen to twenty ton melting capacity. Machine shop facilities and additional buildings available. Now in operation with orders on hand. Reasonably priced. Address: Box 189, The FOUNDRY Cleveland 13, Ohio.

FOR SALE OR LEASE

Modern equipped brass and aluminum foundry in continuous operation for 23 years. Have good selling, finished product. Old age and poor health reason for selling. Address: C. J. Doerr Brass Foundry, 725 N. Delphos St., Kokomo, Ind.

GRAY IRON FOUNDRY

Profitable record; manufacturing two items—leading in the field. Excellent sales representation, yearly sales about $150,000.00, employing 16 men. Only industry in town. Unique business for a total of $40,000 which includes products, tools, real estate and also a nice home. Owner interested in a complete departure from this foundry operation. Address: Box 199, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Small gray iron or aluminum foundry located in the Southeastern States. Must be in operation. Give full information first letter. Address: Box 197, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Core wire straightener for 3/16 to ½ wire, bench or floor type, either with or without motor. Address: STERLING CASTING CORP., BLUFFTON, INDIANA.

Available Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

CAPACITY WANTED

In Eastern foundry now running iron, aluminum and bronze. Should have machine shop facilities. Steady production. Patterns and tools available. Manufacturer and distributor holds contracts on small tools and equipment. If interested address: Box 213, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

2 model M Beardsley & Piper screenerators, 440 volt, 60 cycle, serial numbers 801 and 5M 2740-473. Address: MAUMEE MALLEABLE CASTINGS CO., TOLEDO 5, OHIO.

Classified Advertising

For Sale

FOR SALE
FOUNDRY EQUIPMENT

MOLDING MACHINES
2 "Osborn", mod. 405 jolt rollover
1 "Davenport", mod 40AJS jolt stripper

CORE MACHINES
1 "Taber" pedestal type rollover
3 Grimes Model C-216 rollover
3 Grimes Model C-414 rollover

FURNACES, "Hausfeld"—Melting, Oil Fired
9 100 lb. cap. Magnesium
23 200 lb. cap. Magnesium
4 400 lb. cap. Magnesium
3 1000 lb. cap. Magnesium
6 1200 lb. cap. Magnesium

SAND MIXERS
4 "Simpson" #1½, sand mixer.

MISCELLANEOUS
1 Surface table "Milwaukee" 48 x 72
2 "Tannewitz", mod. R1E, 42" band saw
1 Grinder, snagging, "U. S." double end, 30" wheel with 5 HP motor
10 Flexible shaft grinders, "Haskins"
1 "Kane & Roach" #50X wire straightener —¼" cap.
1 Shakeout, "Simplicity", mod. "B", 4' x 6' with 5 HP motor
4 Jib cranes with 2 ton air hoists
8 Cranes, overhead traveling, bridge type, approx. 38' span 1 & 2 ton
5 Cabinet collectors, "Newcomb-David" wet dust type with pumps, blowers and motors
Flasks; aluminum, steel, magnesium and snap
Bottom boards; aluminum, magnesium and transite
1 Economy portable lifter cap. 1000 lbs (less transmission)
3 Detroit Hoists 1 ton cap., 1 HP motor, type M (DC)
6 Detroit Hoists 2 ton cap., 2½ HP motor, type M (DC)
1 Detroit Hoist 4 ton cap., 7½ HP motor, type LHR (DC)
5 Chicago Pneumatic Air Hoists 2 ton cap. Model A, reversing eccentric
1 Magnetic pulley 20" dia.
1 Graham variable speed transmission Model 60M, Type 101386, Serial 15669
1 Sand strength testing machine "H. W. Dietert" #400
1 Permeability meter, "H. W. Dietert" #320
1 Sand rammer "H. W. Dietert" #310
1 Sieve shaker, "Ro-Tap" with fractional HP motor

1000 lb capacity Magnesium melting pots
200 lb capacity Magnesium melting pots
100 lb capacity Magnesium melting pots

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG. DETROIT, MICH.

FOR SALE
MOLDING MACHINES
4—Osborn, portable type 275J, streamlined
4—International 20" x 8", Type G
1—International P.K.L. jolt squeeze lift
1—Herman, 1500 series, air clamps
CORE BLOWERS
1—Osborn #193, air draw
1—Demmler #3-E, air draw
1—B. & P. 13 ft. tractor type Sand Slinger, 440 volt motors

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

SURPLUS STOCK OF
CRUCIBLE FURNACE COVERS

DOME TYPE COVERS—SILICON CARBIDE
(Standard Ring and Groove)
24" O.D. 8" center opening x 3½" thick ..... $12.00 each
28" O.D. 8" center opening x 3½" thick ..... $17.00 each
30" O.D. 8" center opening x 3½" thick ..... $19.00 each

FLAT TYPE COVERS—FIRST QUALITY FIREBRICK
(Standard Ring and Groove)
24" O.D. 8" center opening x 3½" thick ..... $5.50 each
26" O.D. 8" center opening x 3½" thick ..... $6.50 each
28" O.D. 8" center opening x 3½" thick ..... $7.50 each

All prices are F.O.B. Franklin Park, Ill.
LIMITED QUANTITIES AT THESE PRICES—FIRST COME, FIRST SERVE.

STROMAN FURNACE & ENGINEERING COMPANY
FRANKLIN PARK, ILLINOIS

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
15,000	20 oz.	Ing.Rand	150	440	3570
8700	20 oz.	Ing.Rand	75	220	3500
3500	40 oz.	Spencer	60	440	1800
2200	40 oz.	Spencer	40	220/440	3600
1400	16 oz.	Spencer	220/440	3/60	3600
1000	32 oz.	Spencer	15	220	
900	24 oz.	Spencer	10	220/440	
225	10 oz.	Spencer	1	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
1800	1 in.	Sturtevant	2	220/440	
1150	20 oz.	Nth.Amer.	10	220/440	3600
950	16 oz.	Nth.Amer.			
800	8 oz.	Sturtevant	7½	220/440	3600
800	24 oz.	American	10	220	3600
450	6 lbs.	A&B	30	220/440	3450
1800	1 in.	Sturtevant	2	220/440	
150	12 oz.	Nth.Amer.	1	220	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO

FOR SALE

Motors, generators, transformers, diesels, compressors. "World's Largest Inventory" new and rebuilt. Immediate delivery—stock shipment.

ELECTRIC EQUIPMENT CO.
ROCHESTER NEW YORK

FOR SALE

Simpson 5 H.P. 6 cubic foot Muller
5 H.P. Air Compressor
Haynes Jolt Squeeze
Sand Blast Cabinet Pangborn
Pedestal Grinder Hisey-Wolfe 3 H.P.
Gyratory Riddle
Snap Flasks all sizes
Bottom Boards all sizes
Also other miscellaneous equipment

GARY GRAY IRON FOUNDRY
5816 COPLIN DETROIT 13, MICH.

FOR SALE

145—Sterling Steel Flasks—1 Pin on each side —12 x 18, 3 Cope & 3 Drag.
119—Truscon Steel Flasks—1 Pin on each side —12 x 18, 3 Cope & 3 Drag.
These Steel Flasks are practically new.
2—Tabor, Air Jolt, Rollover Machines 14 x 16 Table.
1—American Sand Cutter, Gasoline Driven.
1—Johnston & Jennings 24 x 30 Rollover.
1—Tabor 30 x 40 Rollover Machine.
1—27 x 36 Wheelabrator.
1—#9 Whiting Cupola complete with Motor, Blower, and Blast Regulator.
10—"G" Power Rollover Machines.
15—Jolt Squeezers of most any make.
1—Automatic lift truck with charger.
1—50" Moulder's Friend Sand Cutter with 15 HP Motor.
1—Grinding Wheel Stand 3 x 24" Wheels.
1—Marshke Swing Grinder with 5 HP Motor.
1—Stearns Magnetic Pulley, New. Serial #20442, 125 volts, RPM 40. Manufactured by Stearns Magnetic Mfg. Co., Milwaukee, Wisconsin.
1—Motor Generator Model #498 Induction motor generator set ¾ KW diverter pole generator, 125 volts @ 6 amp DC with 1½ HP 220/440/60/30 Across the line motor. New.
1—30 x 48 Tumbling Mill with motor, V-belt drive.
1—36 x 60 Tumbling Mill with motor, V-belt drive.
1—30 x 60 Whiting Mill with motor, V-belt drive.
1—SPO Jolt Squeeze Pin Lift Machine No. 614-P, Serial #122. Pattern No. 2138410.
1—"F" rod straightener with Jaeger attachment.
Osborn 558 and 559 Jolt Strippers.
Belting, New, 187 Ft. Ajax 20" 5 Ply 28 oz. conveyor belting with ⅛" top and 1/32" bottom cover.
J.D.P. International Jolt Strippers.
15—J-275 Osborn jolt squeezers
15—J-76 Osborn jolt squeezers

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

For Sale

FOR SALE

1—#4 Whiting Cupola W/new 2700 C.F.M. "North American Turbo-type Blower, 220-440V, 3 ph. 60 cy.
1—Whiting Elevator 1 ton cap. 20' lift (air operated)
1—Sly Sandblast room Type "F", size 8' x 8' x 10' with exhaust fan, bucket, hoist & dust collector.
1—Wardwell Saw filing machine & Saw set. Like new.
1—Lanly Recirculating type oven. Completely automatic, oil fired. Max. temperature 500°. Size 9'4" x 6'6" x 8'6" high.
6—Campbell-Hausfeld #200 Stationary Magnesium Melting furnaces.
1—Sklenar Reverbatory type furnace, oil fired. 1 ton capacity w/air ram, blower, 220 V, s ph. 60 cy.
4—Pit-type furnaces. Fisher burners. Oil fired, #250 crucible size.
1—Air Compressor, Gardner-Denver horizontal. Size 10 x 10. W/motor G.E. 40 hp., 200 V., 3 ph. 60 cy.
1—Wheelabrator Tumblast, operated less than 300 hours. Spare parts, Size 27" x 36".
Molding Machines:
2—Tabor Jar ram, hand rollover, hand draw.
3—Johnson-Jennings, Wall type.
1—Arcade Squeeze, 6" cylinder.
2—Osborn Floor bumpers, 1—18" cylinder, table 42" x 60"
1—16" cylinder, table 30" x 36"
2—Universal Sandthrowers—220 V., 3 ph., 60 cy.
Dietert Sand testing equipment: laboratory normalizer, Permameter, Compression machine, Rammer, Moisture teller, scales & weights, A.F.A. Screens.
1—Ames hardness tester.
1—Lincoln Electric welder, 600 amp. 220 V, 3 ph., 60 cy.
3—Gyratory riddles "Speed Sifters" 1/3 h.p. 220 V, 3 ph. 60 cy.
Miscellaneous equipment includes quantity wood snap & metal slip flasks, jackets, bottom boards, wood flasks & bottom boards. Oil stoves, core ovens, ladles, wire cutter & bender. Stand grinders, vises, table saws, blowers, air grinders, chipping hammers, vibrators, pyrometers, wheelbarrows, scales, core racks, etc.

RIDGE CASTING CORP.
MINERAL RIDGE, OHIO

EQUIPMENT FOR SALE

1—American A.A. Sandcutter, Almost New.
1—42" x 48" American Wheelabrator Tumblast. Excellent Condition.
1—Pangborn 6 Ft. Rotoblast Table, Used only Two Months.
1—Osborn #243 Jolt Rollover.
1—Osborn #601 Jolt Rollover.
1—Osborn #602 Jolt Rollover.

BOX 203
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE
PIG IRON
ANALYSIS

C	4.4–4.8%
Si	.015%
Mn	.2–.4%
P	.01–.03%
S	under 0.10%

OVINGSTEEL INC.
30 CHURCH STREET NEW YORK 7, N. Y.

FOR SALE

Walker—York hot blast crucible brass melting furnace, complete with blower. Will accommodate up to #125 crucible. New—never been used. Price reasonable.

GULF BRASS WORKS
P.O. BOX 871
TAMPA 1, FLORIDA

$225.00 FOR SALE $225.00

#2 Demmler, air operated Core Machine. Graduates according to size of core. Excellent condition. fob. Address: ALLIED MATERIALS HANDLING CO., 4657 SPRING GROVE, CINCINNATI 32, OHIO.

Classified Advertising

For Sale

FOR SALE

MOLDING MACHINES
1—74W Osborn Plain Squeeze Portable
2—75W Osborn Plain Squeeze Portable
3—75J Osborn Jolt Squeeze Portable
3—Federal RAPID Jolt Squeeze Portable
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
BLOWERS FOR CUPOLAS AND FURNACES
1—40 H.P. Spencer-Turbine 5100 CFM 18-oz. pressure
1—Piqua Rotary Pressure Blower, rated 19 cu. ft per Rev.
Maxon-Premix Blowers for Gas, ¼ to 1 H.P.
METAL MELTING EQUIPMENT
1—Stationary crucible aluminum furnace, gas fired, 400# cap. complete with blower and motor
1—Hausfeld 2000# Aluminum Capacity Furnace, Barrel Type, open flame, oil fired
New 32" to 41" Dia. shell Cupolas made to order
TUMBLING MILLS AND SAND BLAST
5—28 x 60" round exhaust mills
1—Pangborn No. 2 GH direct pressure type sandblast barrel, motor driven. Complete Unit
1—Pangborn Sand Blast Unit, including generating tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—Continuous Heat Treat Furnace 57' long 1200° F. Max.
5—Koch electrically heated ovens for baking cores, 4½ ft. wide, 6 ft. high, 6 ft. deep, complete with recirculating fan and controls
1—Young Bros. Tower Core Oven, 5 ft. x 1 ft. shelves, gas fired, complete with Foxboro control
1—Lamson Endless Mold Conveyor, 100 ft. long x 16 ft. wide, with 19 x 26" pallets, 36" on centers
1—Bucket Sand Elevator, 50 ft. tall, complete
4—Heavy Duty Flexible Shaft Grinders 2 H.P.

CLIFTON MACHINERY CO.
1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

2—#2047-1 Osborn Hydraulic Draw Core or Molding Machine, Power rollover and air operated clamps. Used for Cylinder Head Production—Like new.
2—#147-1 Osborn Core Machine. Hand ram, Power rollover and draw—New.
4—#1000 Fisher Automatic Electric Tilting, Nose Pouring Furnaces A-1 condition.
1—#500 Fisher Automatic Electric Tilting, Nose Pouring Furnace A-1 condition.
3—#94 Osborn Core Blowing Machines—Like new.
1—Robins Floatex Shakeout Model J-11. Table 5'x9'—Like new.

Steel Flask Equipment:

15—35"x42"	18" drag	6" cope
1—54"x54"	20" drag	6" cope
3—39"x58"	12" drag	12" cope
2—57"x57"	6" drag	6" cope
26—18"x54"	5" drag	9" cope Cannon type

These flasks were all used under Sand Slinger and are bared in cope. Bottom boards for same. All sizes of furnace blowers.
Tabor Rollovers 4—22"x32" table, 1—30"x40" table.
Transite Core Plates.
Snap flasks and steel bands.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.,
TELEPHONE GLENVILLE 1-1538
15019 SARANAC RD., CLEVELAND 10, OHIO

CRANE SCALES (3)

Yale Close Headroom Model #2701
Dial 1000 pounds x 1 pound
Tare Capacity—250 lbs.

NEW—CLOSEOUT PRICE

SEABOARD INDUSTRIAL SUPPLY CORP.
128 N. 3rd STREET PHILADELPHIA, PA.

FOR SALE

Practically new Simplicity portable shakeout, 3½ x 5, complete with motor. Available immediately. Has been run a few times for demonstration purposes. Can be seen at Buffalo plant. Real bargain at $1200.

LAKE ERIE FOUNDRY CO.
218 CHICAGO STREET BUFFALO, N. Y.

For Sale

LATE MODEL MOLDING MACHINES
Jolt Strip and Pattern Draw—Table Size 36 x 48 16" draw
Jolt Squeeze, Stripping Plate or Pattern Draw 12" cylinder—Table Size 18 x 27—6" draw
Herman Rollover—Table 40 x 50—39" draw

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
TEL: FAIRMOUNT 1-1186

FOR SALE

16—13" & 14" combination jolt squeeze strip molding machines, completely overhauled.

SUTTER PRODUCTS COMPANY
2005 WESTWOOD AVENUE
DEARBORN, MICHIGAN

FOR SALE

3—#36 Osborn core draw machines
1—#42 Osborn core draw machine
3—Mercury std. platform lift trucks, 6,000 lb. capacity and battery charger. AAA-1 condition, ½-¼ original price.

BOX 211
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—Osborn No. 147-3 hydraulic draw core machine, hand ram, hand roll over, equipped with hydraulic draw operation and air operated clamps $1,000.00
1—Osborn No. 147-1 core machine, hand ram, hand roll over $1,000.00

LAKE CITY MALLEABLE CO.
5000 LAKESIDE AVENUE
CLEVELAND 14, OHIO

FOR SALE

1—Whiting cupola #4—56" dia. shell, 45 feet to top of stack. New condition, never erected. Prepared to sell at approximately half price.

WARREN FOUNDRY & PIPE CORP.
PHILLIPSBURG, NEW JERSEY

FOR SALE

SHOT BLAST EQUIPMENT
1 Pangborn GK2 Rotoblast Barrel #14—complete with loading device and abrasive reclaimer
1 Pangborn GK5 Rotoblast Barrel complete with loading device and abrasive reclaimer, "used 1 year"
1 Pangborn 10' x 10' Sandblast Room complete with collector fan and motor.
1 Wheelabrator Tablast, Model BM75300-12" Auxiliary tables like new
1 Wheelabrator Tablast, Model BM49862-24½" Auxiliary tables

CORE BLOWER
1 Champion CB12 excellent condition—real bargain
1 Internationa1 SB13, like new, used 20 hours—65% of original cost

MOLDING MACHINES
1 International Power Rollover Hand Draw, 30" x 42"
1 International Jolt Stripper, 24" x 24"
1 International Stripper, 15" x 15"
2 Arcade Squeeze Molding Machine
1 Johnson & Jenning 31" x 47", Jolt Rollover Pattern Draw.
1 International Jolt Rollover 20" x 8", Type HGD "New"

SAND MULLERS
1 #40 Beardsley & Piper Speedmuller—overhanded—excellent condition
1 #2 Simpson Open Gear Type—bargain

SAND CONDITIONERS
1 72" American Sand Cutter—completely rebuilt and guaranteed
1 NC-4 Royer—excellent condition—bargain

Write us for grinding blowers, hoists, motor, and any other Foundry equipment.
Partial Listing only

SPECIAL
1 "New" Cleveland Tramrail Crane—1½ Ton—20' span, 80' runway never installed—in original crate—real reduction for immediate sale

LAND-WHITEHEAD EQUIPMENT CORP.
P. O. BOX 756
READING 6, PENNSYLVANIA

For Sale

FOR SALE
FOUNDRY MACHINES AND EQUIPMENT

As a result of discontinuing foundry operations a large Western Massachusetts manufacturing Company has the following foundry machinery and equipment for sale:

GE Centrifugal blower rated at 7100 CFM at 1.25 lbs. 550 Volt 60 Cycle 58 HP Motor with controls	1,000
Spencer Turbo Compressor with 7½ HP 550 Volt 60 Cycle Westinghouse Motor	200
Spencer Turbo Compressor with 10 HP 550 Volt 60 Cycle Robbins & Meyers Motor	400
Besley Vertical Spindle Grinder for 53" x 1" x 8" wheel equipped with 10 HP 550 Volt 60 Cycle Motor	500
TABOR MOLDING MACHINES:	
13" x 18" Split Pattern Stripper	200
13" x 18" Split Pattern Stripper	500
6-10" Jar Squeezer ..... each	75
22" x 40" Shockless Jarring Portable Rollover	800
OSBORN MOLDING MACHINE Model 553 Jolt Pin Lift	250
Sand Cutter—American 99/80M with 220 Volt 60 Cycle Motors	4,650
Jarecki Type BB Screw Press	150
GRINDERS, Portable 17,000 RPM Pneumatics #0 Ingersoll-Rand with #290 Collett	20
8—#2 E5—Ingersoll-Rand ..... each	25
Hercules	25
CHIPPING HAMMERS:	
2—Cleveland #1W Style BH Pneumatic ..... each	10
7—Ingersoll-Rand 100# Pneumatic each	10
ALPHA LUX SPEEDY MOISTURE TESTER	75

The above items have been priced for quick sale and may be inspected at our plant. All orders will be accepted subject to prior sale, net cash, f.o.b. truck or cars at our plant. If you wish further information or would like to make an inspection, write

BOX 169
THE FOUNDRY CLEVELAND 13, OHIO

Following Machines have been completely rebuilt and in A-1 shape.
3—10" Haynes, Portable, Price $185.00 each.
12—Osborn J-75, Portable, Strand Rod Type, 10" squeeze piston, 3" jolt piston—$165.00 each.
1—International, Portable, Strand Rod Type, 9" squeeze cylinder, 3" jolt cylinder—$165.00.
3—Adams, Portable, Strand Rod Type, 10" squeeze cylinder, 4" jolt cylinder—$165.00 each.
2—Milwaukee, Portable, Swing Head Type, 10" squeeze cylinder, 4" jolt cylinder—$175.00 each.
4—Milwaukee, Stationary, Swing Head Type, 10" squeeze cylinder, 4" jolt cylinder—$175.00 each.
1—Tabor, Portable, Cantilever Type—$165.00.
2—Milwaukee, 12" Stationary, Swing Head Type—$200.00 each.
1—Milwaukee, Stationary, 13" squeeze cylinder, 7" jolt cylinder—$210.00.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE

Pangborn 14 cu. ft. barrel type Rotoblast with loader, reclaimer, motor, spare parts, etc. Now operating. Complete $3950.00. F.O.B. Cars. Address: KEEN FOUNDRY COMPANY, GRIFFITH, INDIANA.

FOR SALE

20 Osborn 275 JW stationary Jolt Squeeze molding machines
#2 Simpson Mixer reconditioned
8 Walker York Coke Fired melting furnaces, stationary
1000 Transite Core Plates
Reservoir ladle, 2000 lb. hand operated gear driven tilt modern equipment
500 Small steel and iron flasks
2 Fisher tilting Furnaces 400, one gas, one oil
We also carry in stock at all times, blowers, motors, grinders, wooden and steel tanks. We are always in the market for good used Foundry Equipment.

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 EAST BROAD ST.
SHILLINGTON, READING, PA.
PHONE READING 30311 or 40146
R. B. HARRISON, MGR. FDY. DEPT.

Classified Advertising

For Sale

FOR SALE

Steel City brinell testing machine, Type A-4—motor operated. Clearance between uprights 3 ft. 8 inches. Maximum height of work possible—51 inches.
Six (6) Edison industrial lift truck batteries Type 24A8-8B.
Three (3) Dravo Floor mounted unit Heaters. Stoker fired—1,000,000 Btu capacity. Stoker equipped to burn buckwheat coal.
Lot of 20 hi-cycle tool grinders wired for 110 V, 3 phase, 180 cycles.
Lot of Hines aluminum heavy duty pop-off flasks. Flask sizes from 12 x 24, 16 x 16, 18 x 24, 24 x 48, 34 x 47, 36 x 36, and 42 x 42.

Two (2) Osborn #332-38 jolt, squeeze, rollover, power draw molding machines, stationary.
Flask capacity: 26 x 36.
Flask space: 18"
Draw: 10".
All equipment in excellent shape.
Complete details available.

LEBANON STEEL FOUNDRY
LEBANON, PA.

PANGBORN ROTOBLAST

4 spindle automatic table equipped with BVR-7 Pangborn abrasive separator and bucket belt elevator, 20 hp, 5 hp and 2 hp motors included. $2500.00 fob. Address: ALLIED MATERIALS HANDLING CO., 4657 SPRING GROVE, CINCINNATI 32, OHIO.

EQUIPMENT FOR SALE

13' Beardsley & Piper tractor-type sand slinger with magnetic separator tower; Sand leveling device; 16" x 4" x 20 HP head; Arms; 6'0" & 4'-0"; Turning device; 220 volt, 3-phase, 60 cycle; Serial No. T-178. Installed new during 1946 and used one shift for 5-6 months. Condition: Excellent-like new. Address: Box 185, The FOUNDRY, Cleveland 13, Ohio.

SAND BLAST EQUIPMENT

Pangborn 28GK rotoblast barrel, complete with loader $5500.00 spare parts. A-1 condition. $5,000.00.
Pangborn 6 foot table. Good condition. $1200.00.
Pangborn direct pressure tank, model AQ1. Like new. $575.00.
Pangborn blast cleaning barrel. IGF. $200.00.
Wheelabrator 15 x 20 tumblast with blower and dust collector. $1200.00.
Sand blast cabinets, dust collectors and blowers. A 1 kinds and sizes. Like new. 60% less list price. Crane—2-ton twin hook—21' span $400.00.
Washing machine and rinse 19'L x 5'W. Conveyor type—$350.00.

DIAMOND SAND BLAST INC.
5654 W. JEFFERSON AVE.
DETROIT 9, MICH.

FOR SALE
OVERHEAD CRANES
IMMEDIATE SHIPMENT

30 TON P & H
5 Ton Aux. Hoist
Span—49'2"
Cab Controlled
4 Motors—3/60/220 AC
Lift—25 Ft.

15 TON P & H
Span—49'2"
Cab Controlled
3 Motors—3/60/220 AC
Lift—22 Ft.

10 TON P & H
Span—49'2"
Cab Controlled
3 Motors—3/60/220 AC
Lift—22 Ft.

GOOD CONDITION
CAN BE SEEN IN OPERATION
IRON & STEEL PRODUCTS, INC.
"ANYTHING CONTAINING IRON OR STEEL"
13444 S. BRAINARD AVE.
CHICAGO 33, ILLINOIS
BAYPORT 1-3456

FOR SALE

27 x 36" American Wheelabrator tumblast and loader. Excellent condition. Address: Box 115, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

Complete pattern equipment for malleable pipe fittings, sizes ⅜" to 2", or will cooperate with a foundry to produce on percentage arrangement. Address: LAKESIDE FOUNDRY, WARSAW, INDIANA.

FOR SALE
FOUNDRY EQUIPMENT

1—Osborn #1-193 Core Blow Draw Machine with additional Roller Frame, #11878-C.
1—Osborn #92 Core Blowing Machine #11408-E.
1—International Type REDP Air Clamp, Electric Turnover, Air Draw Molding Machine. Size 20" x 36" x 8" complete with motor and controls. Practically new. Purchased January 1949. Used part time only for not over six months.
4—Osborn #403-W Jolt Rollover-Pattern Draw Molding Machines #5457-G, 5642-A, 10503, 10692-A.
4—½Osborn #403-W Jolt Rollover-Pattern Draw Molding Machines #6525-A, 6614-E, 11463, 11905.
1—Osborn #147 Hand Ram, Hand Rollover, Draw Core Machine #11956-A.
1—Osborn #405-97 Jolt Rollover-Pattern Draw Molding Machine #10845-C.
1—Osborn #602 Jolt Rollover—Pattern Draw Molding Machine #10902-R.
1—Osborn #601 Jolt Rollover—Pattern Draw Molding Machine #10339-E.
1—Yale & Towne K22-4—4000# Capacity Nontelescopic High Lift Platform Truck #42640.
1—Yale & Towne—4000# Capacity—4" Lift Truck. Both trucks offered complete with Exide Batteries.
1—Model NDP Royer Sand Separator and Blender.
2—Brinnel Test Machines.

All above listed equipment is in good operating condition. Has had preventitive maintenance during entire life.
Miscellaneous other foundry equipment. Inquire if interested in any particular items.

THE MANUFACTURERS FOUNDRY COMPANY
TEL. 3-3109 **WATERBURY, CONN.**

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words or less, $2.50. Additional words 9c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $5.00. Additional words 15c each.

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Any advertisement set in all capital letters, add 50% to the above rates.

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7 inches	82.50	75.00	67.50	60.00
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Half Page	162.50	150.00	137.50	125.00
Full Page	275.00	250.00	225.00	200.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

Classified Forms Close the 13th of Month Preceding Issue

THE FOUNDRY
Penton Building, Cleveland 13, Ohio

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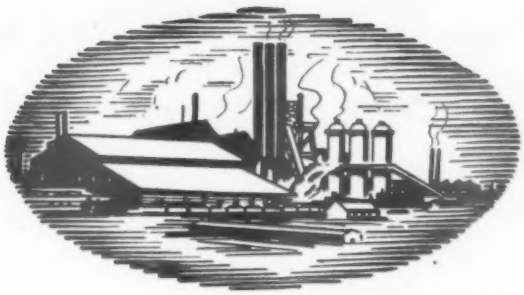


1900 ★ THE MIRACLE OF AMERICA ★ 1950

Freedom and Progress

It's no stretch of the imagination, rather, robust realism to call our past half century a Miracle—U. S. A.

America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the biplane? A far cry from our FM radio, television, hydro-matic drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

- Since 1900 we have increased our supply of machine power 4½ times.
- Since 1900 we have more than doubled the output each of us produces for every hour we work.
- Since 1900 we have increased our annual income from less than $2400 per household to about $4000 (in dollars of the same purchasing power), yet . . .
- Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

Published in the public interest by:

THE FOUNDRY

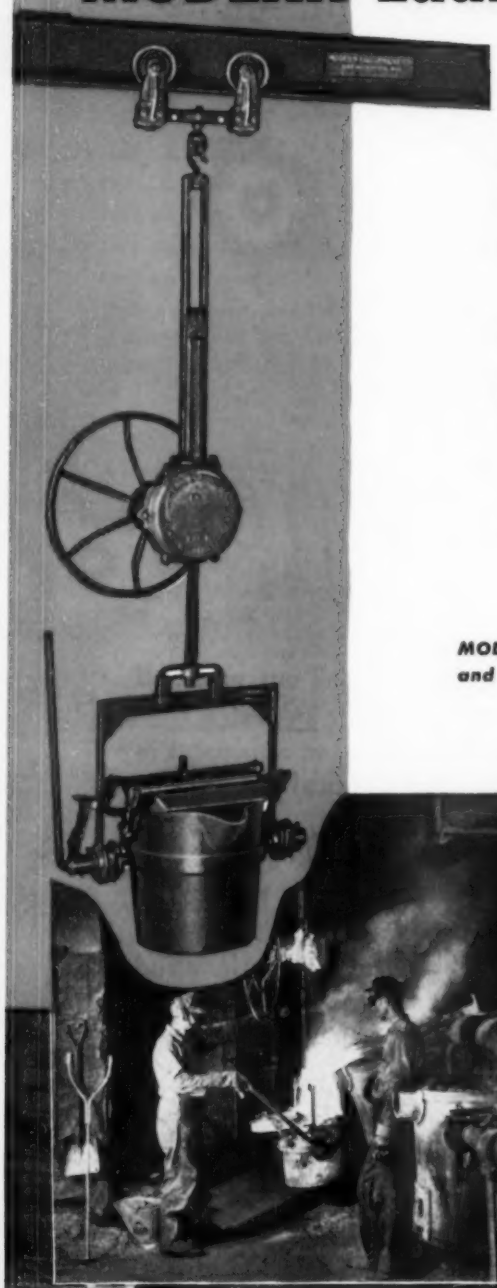
MODERN Ladles Pour the Nonferrous Metal

1500 TAPS IN THREE MONTHS

This MODERN ladle, in service here at the Milwaukee Flush Valve Company, handles all the plumber-brass from a battery of four, 650 pound oil furnaces.

The heat is brought down in one hour. Metal is tapped at 2275° F. At the last mold the brass still flows at 2100° F. to maintain the same high quality from the first to the twenty-fifth casting poured.

Between heats the ladle temperature is brought up in an oil pre-heater.



MODERN Ladle, Pouring Device, Monorail and Crane are engineered as a unit for one-man pouring.

Every detail of design — from the fast-action, pull-back ladle cover to the free movement and smooth transfer of the load over the monorail and crane—is a part of MODERN planning for economical, one-man pouring.

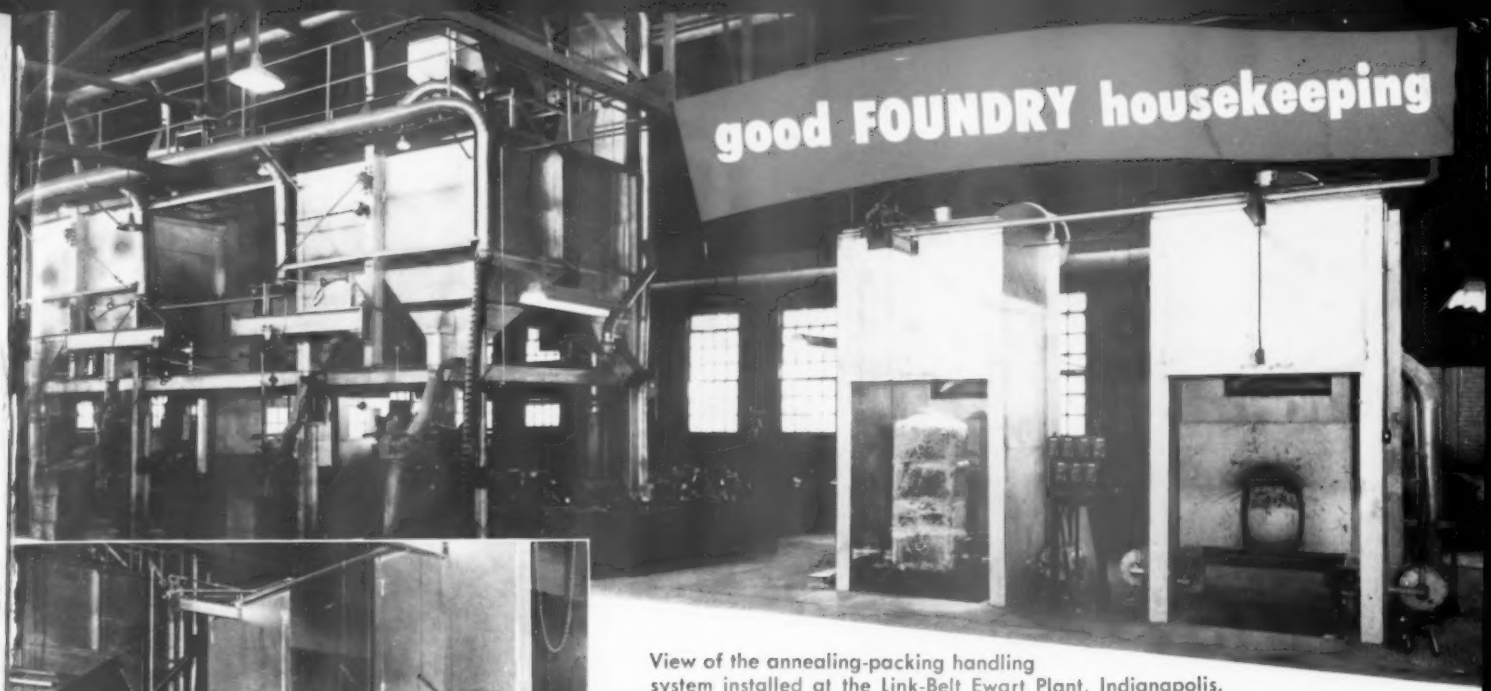
Here the entire heat, 650 pounds of brass, is drawn in two taps. 325 pounds per trip from furnace room to pouring floor uniformly fills the 25 molds in approximately six minutes.

There's seldom any metal left over to be pigged. Every ounce crosses the pay scale.

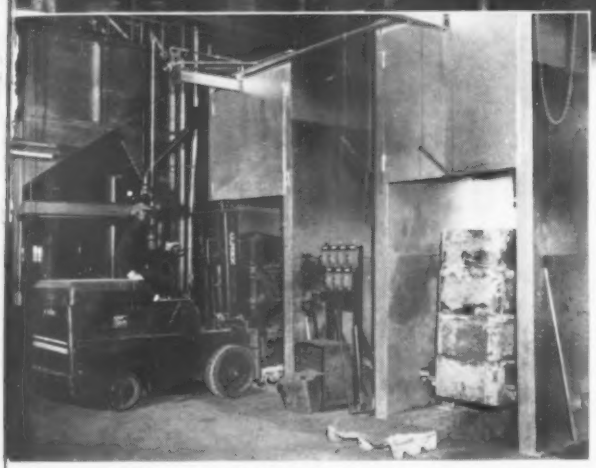
It'll pay you well to pre-plan your pouring for profits. And the savings you make on your MODERN engineered-to-the-job ladles can be applied to your purchases of MODERN POURING DEVICES, MONORAIL SYSTEMS and foundry CRANES! For the complete MODERN story call your local MODERN representative. Ladle catalog 149 will be mailed free if you make request on your company letterhead — Dept. F-10 . . .

MODERN EQUIPMENT CO.

PORT WASHINGTON, WISCONSIN



View of the annealing-packing handling system installed at the Link-Belt Ewart Plant, Indianapolis, showing the two material storage bins and the two shakeout booths with complete dust collecting system. The two storage bins provide four packing stations equipped with swivel spouts and hydraulically operated platforms for convenient loading of pots.



When the pot bottom is withdrawn at the shakeout, castings and packing material drop to vibrating shakeout screens, which separate the castings from the material. The material is returned to the storage bins by means of oscillating conveyor, bucket elevator, vibrating screen for dust removal and an overhead belt conveyor.

Annealed castings are discharged from shakeout screens onto a piano-hinge apron conveyor that carries them to the cleaning room.

A Shakeout Screens delivering castings to piano-hinge apron conveyor.

LINK-BELT

Annealing-Packing Handling

No more dumping hot packing material and malleable castings on the annealing-room floor with its resultant dusty haze, excess heat and disorder.

At its Ewart Plant in Indianapolis, Link-Belt uses its own mechanization by installing this annealing-packing handling system. The resulting "good housekeeping" provides much better working conditions as well as lower handling costs.

This installation handles approximately 60 tons of castings a day. The packing material handled amounts to approximately 100 cubic feet an hour with surge loads up to 200 cubic feet an hour.

Whatever your annealing capacity requirements, it will pay you to look into the advantages of this "good housekeeping" method. Ask our nearest office.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

12,109

LINK-BELT

Handling and Sand Preparation MACHINERY

STEVENS
CORE PASTES

dry faster
hold firmer
go farther

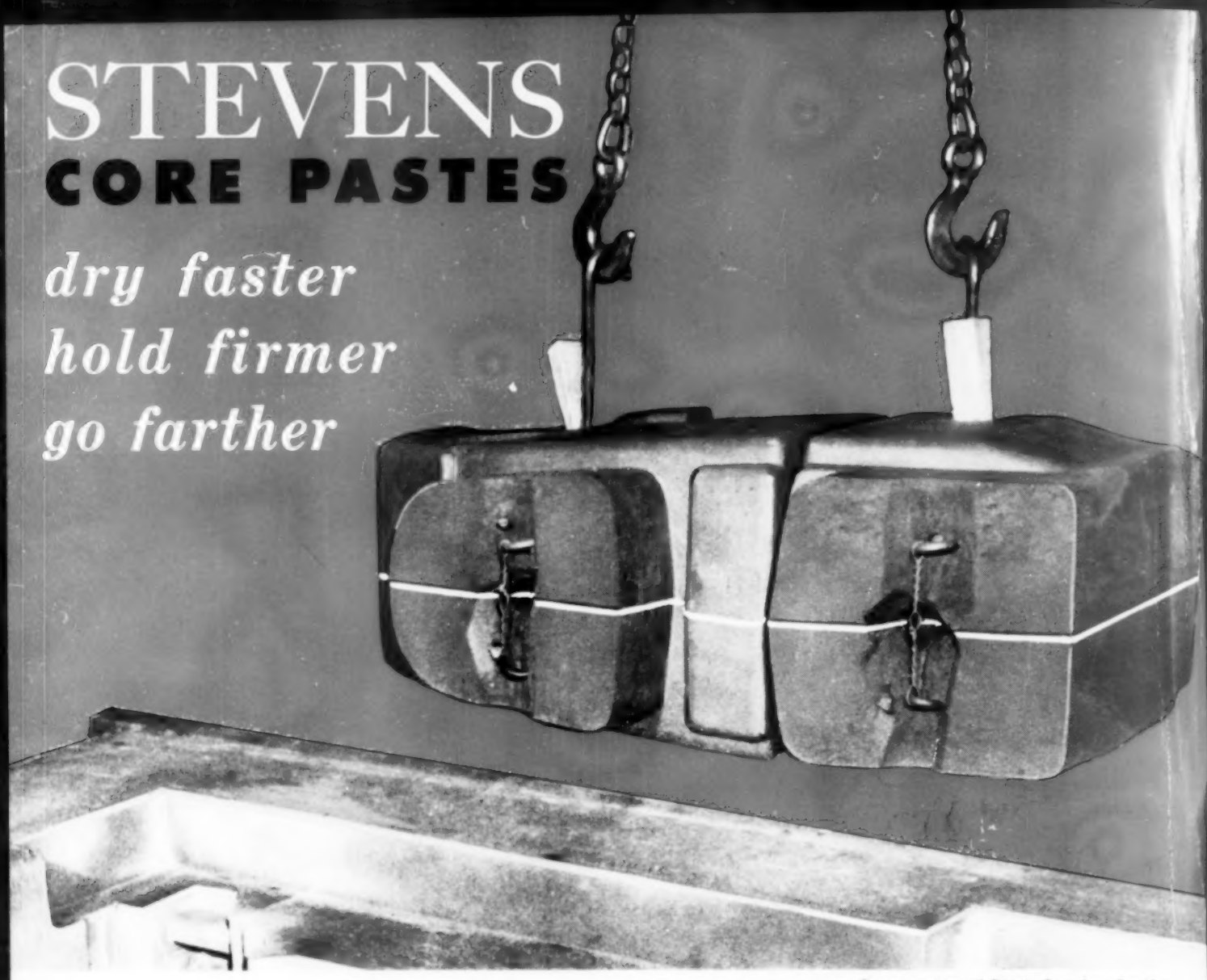


Photo: courtesy of Detroit Gray Iron Foundry

Boost production and lower costs in your foundry with Stevens Core Pastes. You'll find that these laboratory-tested core pastes dry rapidly and make a joint that is actually stronger than the core itself. What's more, Stevens Core Pastes are remarkably economical. Applied either by hand or by bulb, a little bit goes a long way.

Why not reap these benefits of faster core processing, safer handling of cores? Stevens offers various grades of core paste to meet every individual requirement. Order a barrel today—the easy way. Merely send us the data on your foundry operations and we will ship the grade that will best meet your needs—subject to your complete satisfaction. If you are not highly pleased with the way Stevens Core Paste works, return the unused portion and receive full credit.

STEVENS CORE PASTE

- ★ PERMITS FASTER HANDLING
- ★ HAS HIGH "GREEN GRIP"
- ★ MIXES EASILY, SMOOTHLY
- ★ DOES NOT "BOIL OR BUBBLE OUT"
- ☆ DOES NOT FERMENT WITH INTERMITTENT USE

LEADING MANUFACTURERS AND DISTRIBUTORS OF FOUNDRY FACINGS, EQUIPMENT AND SUPPLIES

FREDERIC B. STEVENS INCORPORATED

DETROIT 16, MICHIGAN

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